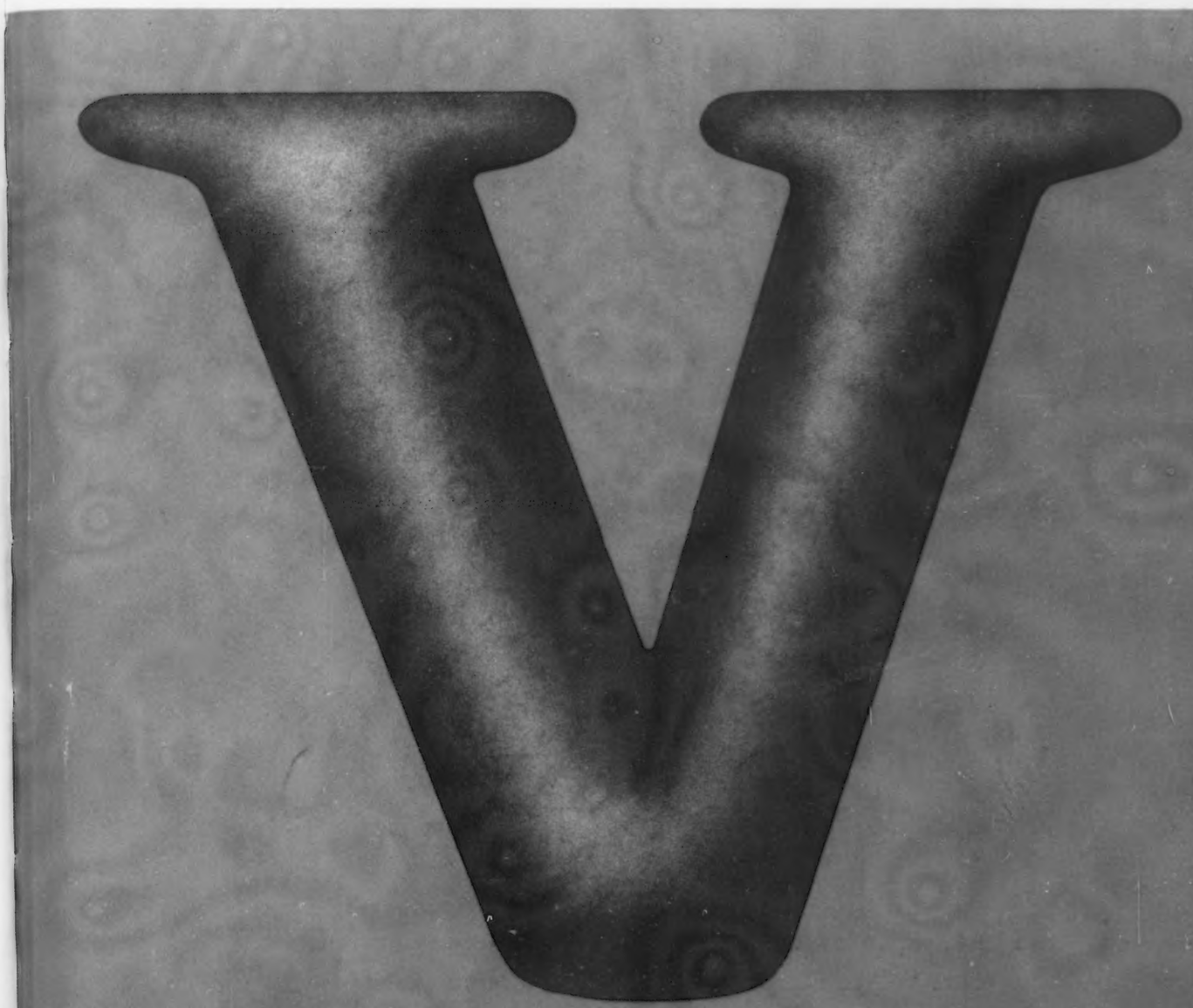
OCTOBER 9, 1941

The IRON AGE



WHAT WE MAKE ★ ★ ★ ★ ★ ★

ELECTRIC HEAT TREATING FURNACES * PYROMETERS

THERMOCOUPLE AND LEAD WIRE * WELDING WIRE

SPARK PLUG ELECTRODE WIRE * PROTECTION TUBES

HEAT RESISTANT CASTINGS * ENAMELING FIXTURES

SPECIAL ALLOYS OF NICKEL * HEATING ELEMENT ALLOYS

All these products are based on nickel. We list them so you may know what we can supply, if your orders have a priority rating sufficiently high. We do our best to fill all orders, but what we can deliver is, of course, controlled by O.P.M. . . . We've made high nickel alloys almost since the turn of the century. All metal is melted by high frequency induction, your assurance of good quality alloys.

THE WIRE THAT MADE ELECTRIC HEAT POSSIBLE

Chromel
NICKEL | CHROMIUM

HOSKINS MANUFACTURING CO., DETROIT MICHIGA

OCTOBER 9, 1941
VOL. 148, NO. 15

This Week in . . .

THE IRON AGE

Twenty-Third Metal Congress Issue

Ryerson Night Loading Assures Quicker Deliveries

IT'S after hours, at any of the ten Ryerson steel plants, almost any night of the year!

The Ryerson night shift is putting the finishing touches on today's orders; loading out the fleet of big, red Ryerson trucks for tomorrow's deliveries.

The entire Ryerson organization is geared up to handle quickly the steel requirements, simple or involved, of thousands of customers the country over. Special telephone order desks, hourly mail pick-ups at the post office, telegraph and teletype lines into our offices—all help to speed delivery, even *before* the order reaches us.

Night loading to "clear the decks" for tomorrow's new crop of orders is the regular course of business. Every order is RUSH at Ryerson.

Ryerson Steel Service is as fast and sure as today's unusual circumstances will permit. Ryerson Certified Quality is your assurance of uniformity and exactness. Make the Ryerson Stock List your number one source for all steel requirements. If you haven't the latest Stock List we'll send one gladly.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

RYERSON

THE IRON AGE

OCTOBER 9, 1941

ESTABLISHED 1855

"Bring 'Em Back Alive"

IT takes more skill, more intelligence and more planning to "bring 'em back alive" than it does to shoot them. Witness Frank Buck.

In war time, when there is a shortage of food, we feed the fighting men square meals and ration the civilian population. We do not cut off food supplies entirely from the civilians and let them starve. England, for example, is adopting this rationing policy as are Germany, Italy and other nations.

Under a rationing system, people may be undernourished but at least they have a chance of survival and a hope of being able to put flesh back on at some time in the future when the emergency is over.

It seems to me that we should adopt this policy and apply it to our so-called non-defense industries during this defense emergency, with respect to materials. Steel for example.

Some of our non-defense industries are threatened with steel starvation. And there is no substitute diet for steel as there is for many other materials, like aluminum, nickel, chromium, copper, etc., which are actually scarce in view of defense requirements.

Such scarcity is not the case with steel. Properly rationed, our steel producing capacity is great enough to satisfy every conceivable demand of defense, including aid to Great Britain, Russia and China, and leave a considerable percentage over. No studies yet made, even the most grandiose, have shown where or how our defense and aid activities as scheduled can possibly use more than 40 per cent of our total ingot capacity.

On the basis of our present ingot capacity of 86 million tons, the remaining 60 per cent which should be available to non-defense industries amounts to 51 million tons, or enough to permit these non-defense enterprises to do business practically on their 1939 basis. For during that year, our total ingot production was only 52½ million tons. And that included considerable aid to England and France on the "cash on the barrelhead" plan.

Even if we should eventually have to put the non-defense users of steel down to but 36 per cent usage of present capacity, or 31 million tons, they would be as well off for steel as all our industries were in 1938, when total production was but 31½ million tons. And that would be better than starving them to death.

Our non-defense industries are going to be our lifeblood after this thing is over. Let's ration them with definite, even though severely curtailed, allocations based on past usage of steel, rather than shoot them to death with priorities.

Refugee kiddies inspect a new ambulance presented by the British-American Ambulance Corps.

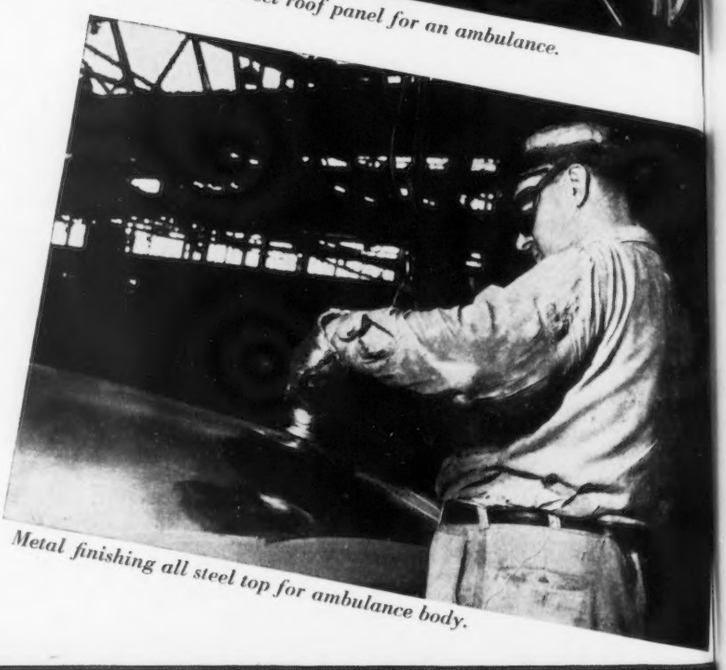
Some
Inland Defense Steel
Goes on
Errands of Mercy

Every day Inland ships thousands of tons of steel for the Defense Program. A large part of the tonnage is used for constructing new plants, building equipment and manufacturing munitions. However, some Inland Defense Steel goes on errands of mercy. Typical of this are the Inland Sheets used by automobile manufacturers in building ambulances for service not only in our own army camps, but also in the camps and among the civilian populations over seas.

Inland has always been proud of its ability to serve customers well through a closely knit organization, complete control of raw materials and modern plants. And now—because defense is Inland's No. 1 Job, all Inland men and all Inland facilities are coordinated in serving our Government to the fullest extent possible in the present emergency.

SHEETS · STRIP · TIN PLATE · BARS · PLATES
FLOOR PLATE · STRUCTURALS · PILING · RAILS
TRACK ACCESSORIES · REINFORCING BARS

Gun welding an all steel roof panel for an ambulance.



Metal finishing all steel top for ambulance body.

INLAND STEEL CO.

38 S. Dearborn Street, Chicago • Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City, Cincinnati, New York

STAINLESS STEEL

By J. M. BANDEL
Electro-Metallurgical Co., New York

AN entire new group of data is shown herein for the first time, as is also a new procedure for comparing physical properties. The work covers cold rolled Cr-Ni stainless steel strip and touches on recent experiments on Cr-Mn-Ni alloys. It is believed the airplane designer and everyone else using stainless steel will over the coming years find this work of great value in selecting the proper steel for a specific application.—Ed.

THE wide range of useful and remarkable mechanical properties that can be obtained in the chromium-nickel stainless steels have not been fully appreciated. These steels are used in many applications, but have found the greatest favor in those involving the necessity for excellent heat or corrosion resistance. Extensive experimental work has been done both in the laboratory and in the field which has established these later properties. Due perhaps to this intense interest in the heat and corrosion resistant properties of these alloys, their fine mechanical properties have not been justly appraised. More recently the demand for strong light weight structures, particularly in the transportation field, has stimulated new interest in the mechanical properties of these alloys. In order to meet this demand a good deal of experimental work has been directed toward the composition, processing and testing of these alloys in order to fully exploit these properties. The Electro-Metallurgical research laboratories have pioneered in this work, and it is the purpose of this article to present and discuss some of the data developed at these laboratories.

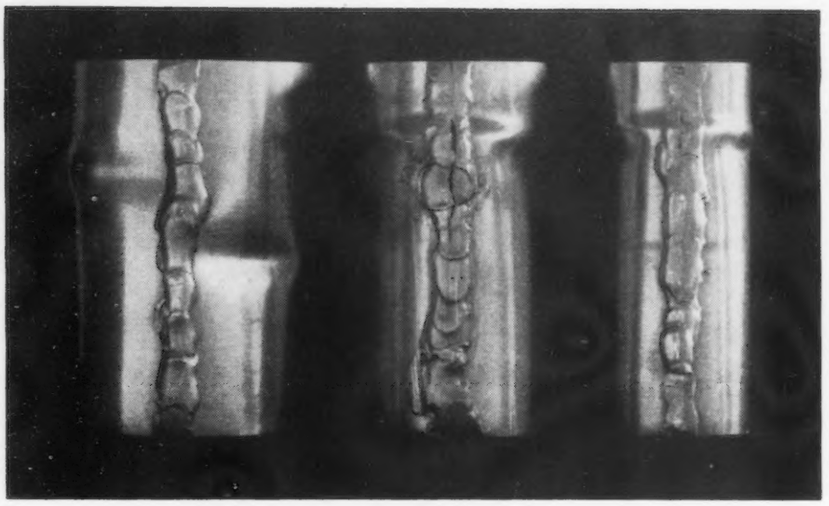
It has been recognized for some time that cold working the chromium-nickel austenitic alloys greatly improved their tensile and tensile yield strengths. Some data have also been available which indicated like improvement in their compressive properties. However, until recently, the effect of composition and suitable heat treatment on these properties has not been appreciated. Thus, the object of the tests has been to establish the mechanical properties of some of these alloys after various degrees of cold work and to study the effect of heat treatment and analysis.

The material tested was made at the laboratories or purchased in the form of hot rolled strip. In all cases it was annealed, pickled, and cold rolled to a finished thickness of 0.035 in. at the laboratory. In cold rolling the material standard mill practice was employed. A low temperature stress relieving heat treatment (200 to 300 deg. C. for 24 to 72 hr. and air cooled) was given some of the material.

Test Procedure

The detailed method of testing used has been published* and will not be repeated here. However, in the interest of integral completeness a summary of this test procedure is believed desirable.

Tensile tests were made on standard size A.S.T.M. sheet tensile specimens using a 60,000 lb. Baldwin Southwark hydraulic testing machine. A Berry gage having a 2-in. gage length was used to measure the deformation between the



A B C

FIG. 1—Type of failure obtained on three compression specimens of various dimensions.

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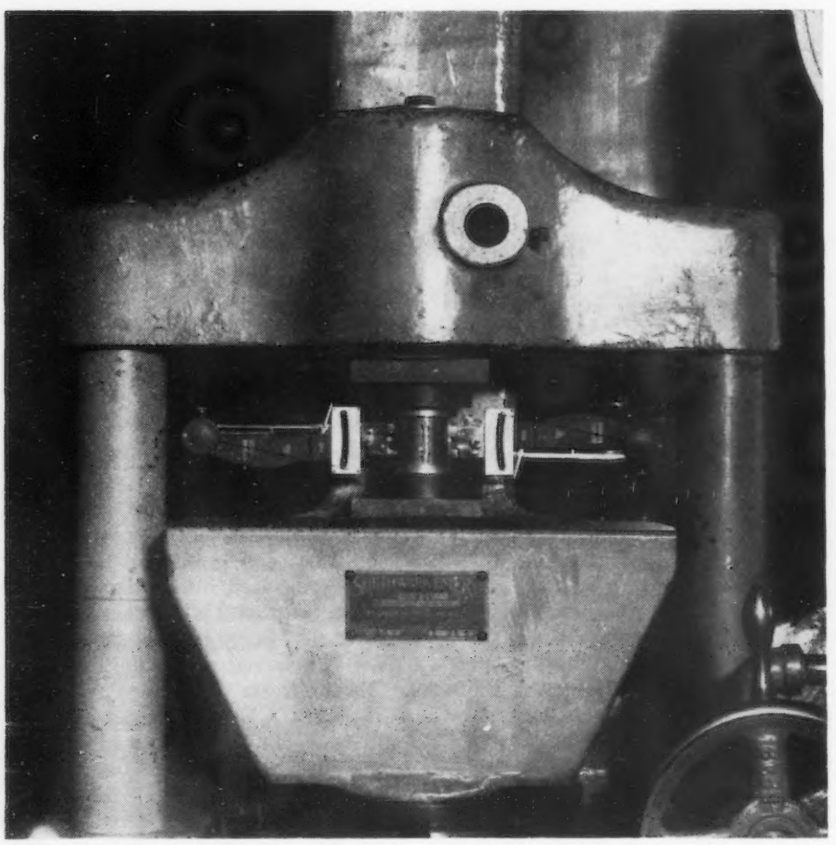
FIG. 2—Compressive specimen set up in the testing machine with the Huggenberger gages in place.



proportional limit and the yield strength (0.2 per cent offset). Two metric Huggenberger type A gages (one on each side of the specimen) having gage length of 2 cm. were used to measure the elongation up to the proportional limit.

Compressive tests on formed cyl-

*A.S.T.M. preprint (June, 1941) entitled, "The Stress-Strain Characteristics of Cold Rolled Austenitic Stainless Steels in Compression as Determined by the Cylinder Test Method," by Russell Franks and W. O. Binder.

indrical specimens were made with the same machine used for the tensile testing. These specimens were prepared by the cold forming of the thin strip into hollow cylinders. The longitudinal joint in these cylinders occasioned by the abutting edges of the sheet was sealed with soft solder. The dimensions of these cylinders must be properly selected so that adequate slenderness and diameter to thickness ratios are obtained. Correctly proportioned cylinders can be stressed beyond the yield point without premature failure due to local instability. Fig. 1 shows the type of failure obtained on three compression specimens of various dimensions and clearly indicates the importance of properly designed cylinders. The diameters of cylinders A and B are too large in relationship to the strip thickness and cylinder length. As a result, the specimens exhibit a non-uniform local failure. Cylinder C is an example of the type of failure obtained in a correctly designed specimen. It will be noted that the failure is uniform around the circumference of the sample. Failures of this nature are obtained with cylinders formed from 0.035-in. thick strip when the diameter is approximately 1.5 in. and the length is 2 in.

In the compressive tests two metric Huggenberger type A gages (2 cm. gage length), one on either side of the cylinder, were used to measure the deformation. Fig. 2 shows a compressive specimen set up in the testing machine with the Huggenberger gages in place.

In both the tensile and compressive tests the load deformation readings were converted into stress strain values and plotted to a large scale. The proportional limits, yield strengths (0.2 per cent offset) and moduli of elasticity were deter-

PROPERTIES OF COLD ROLLED STAINLESS STEEL

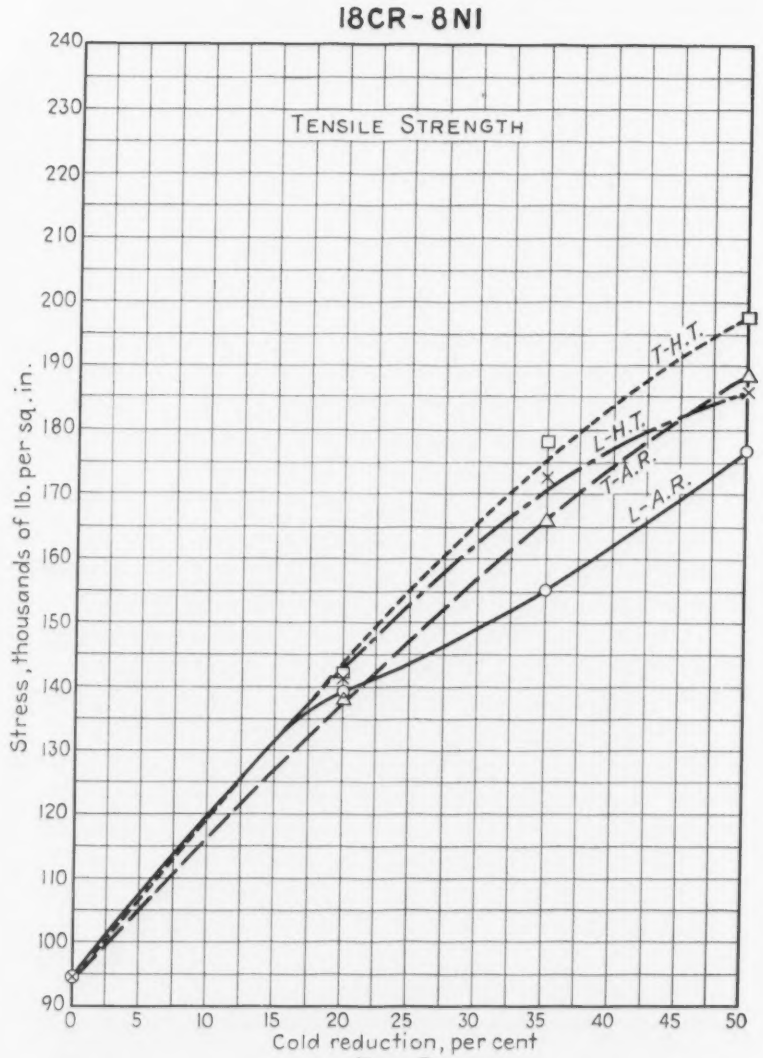


FIG. 3

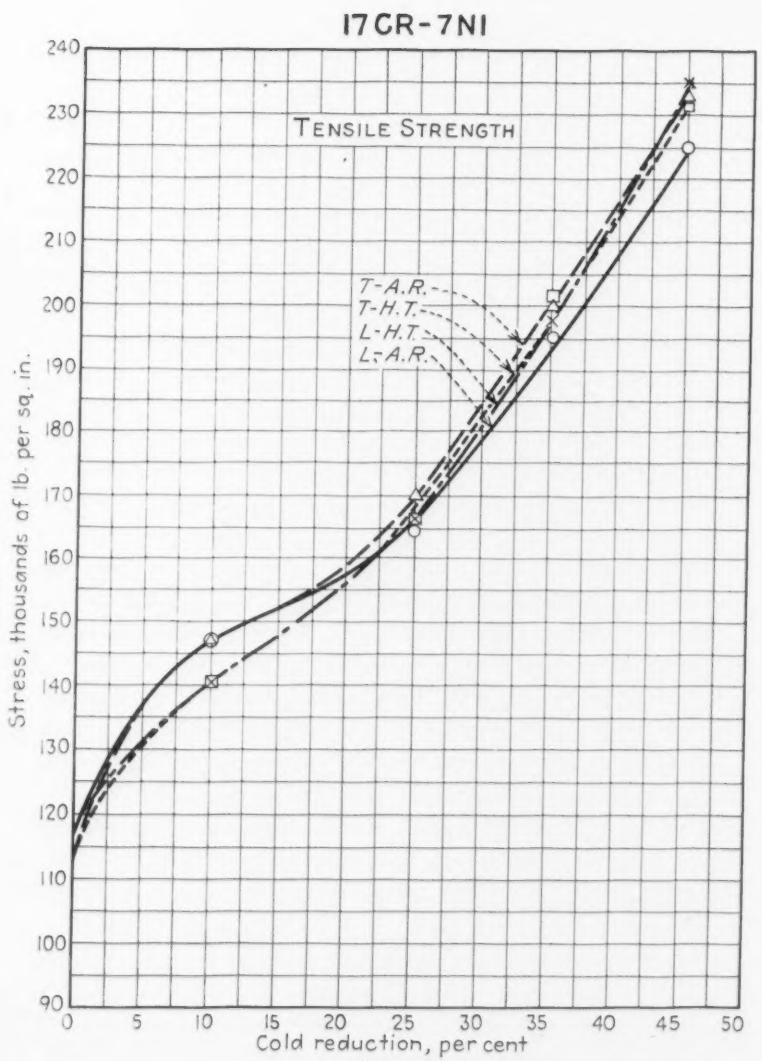


FIG. 4

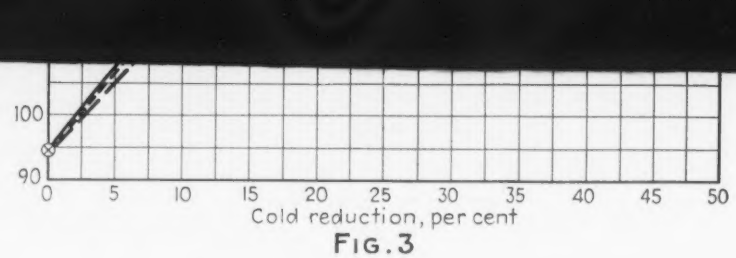


FIG. 3

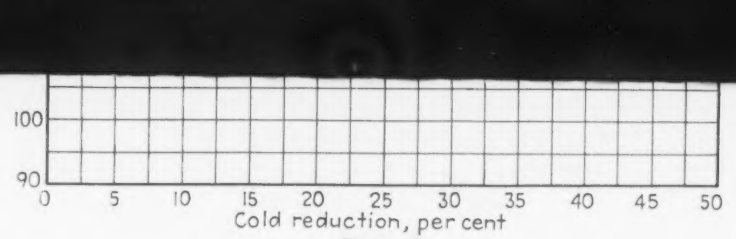


FIG. 4

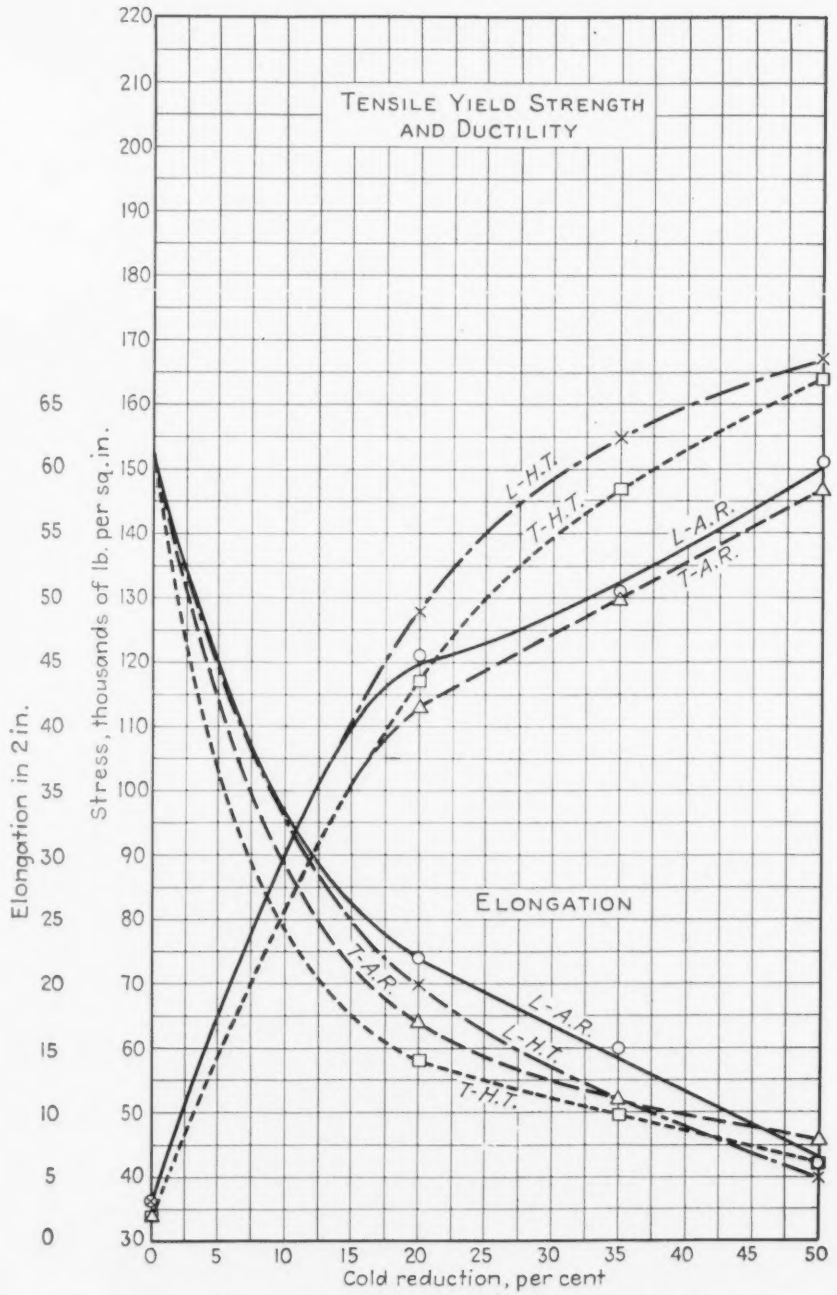


FIG. 5

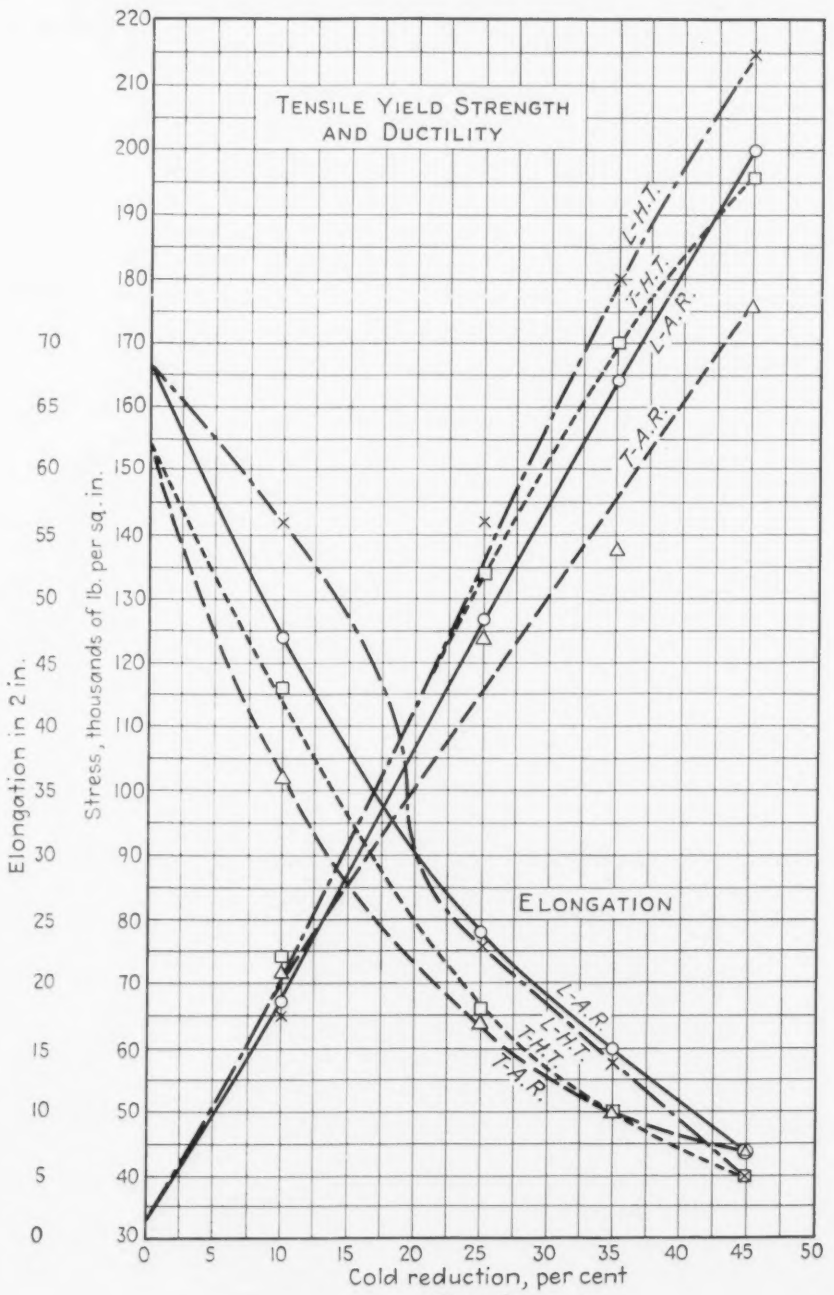
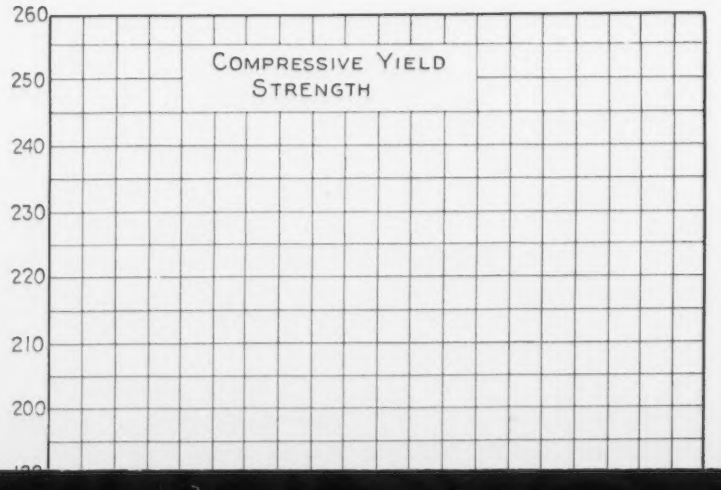
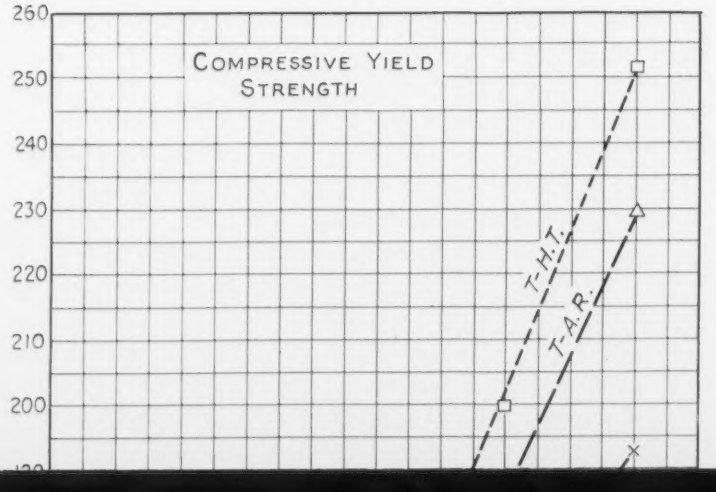


FIG. 6





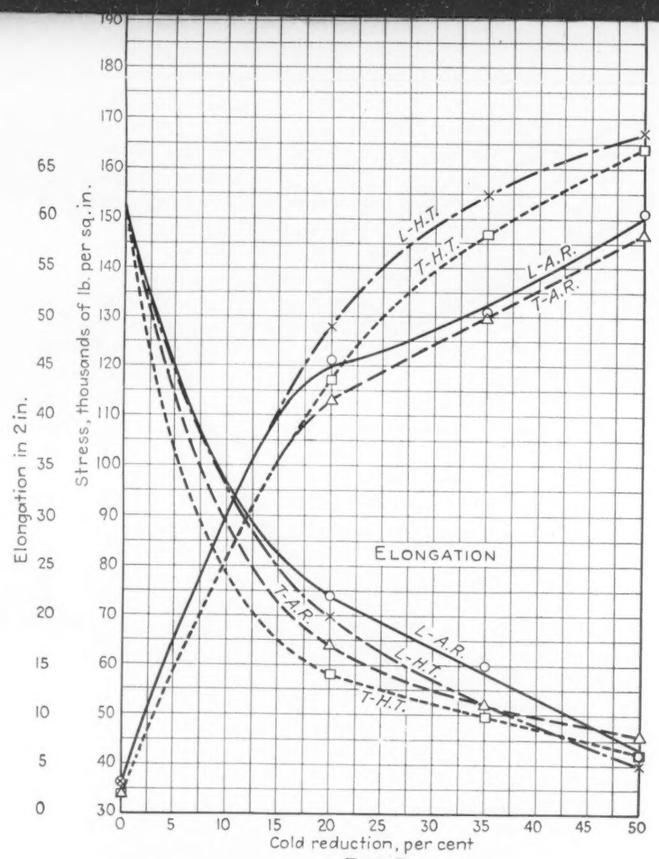


FIG. 5

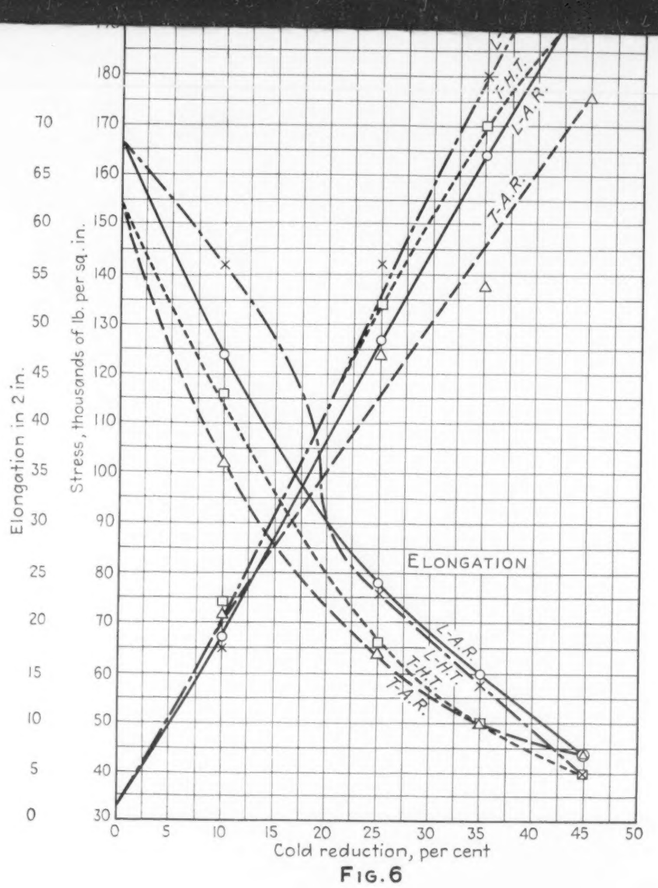


FIG. 6

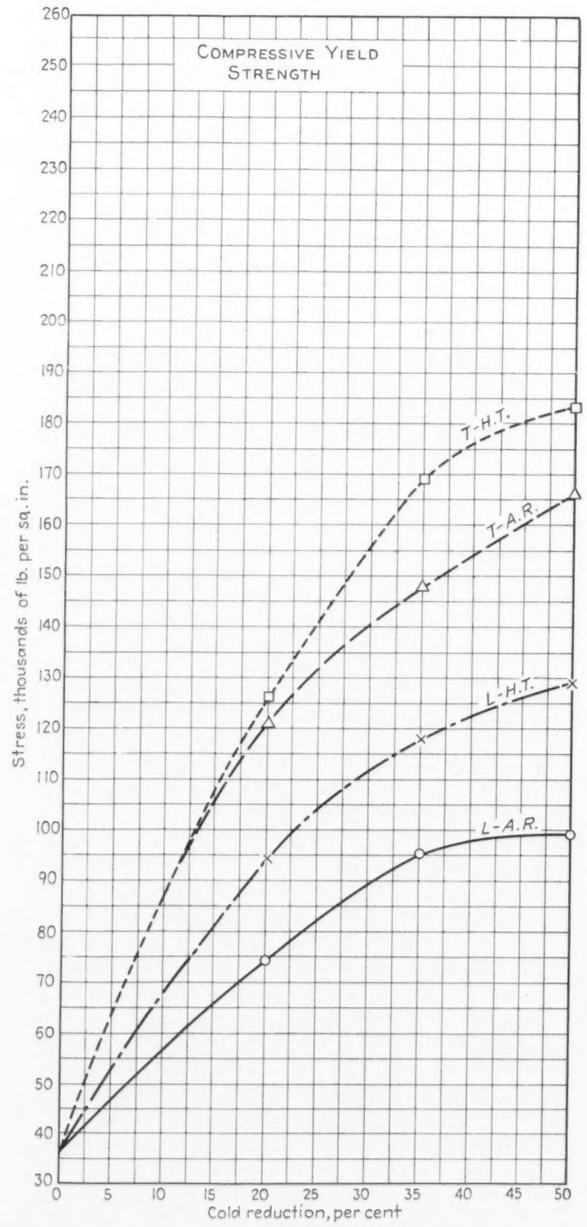


FIG. 7

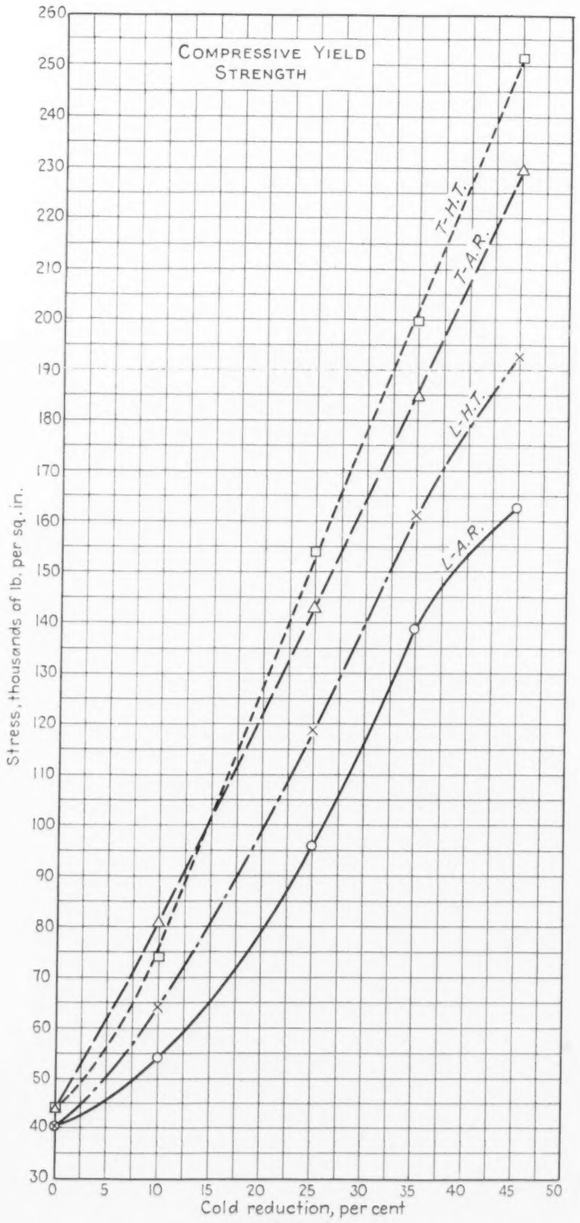


FIG. 8

—○—○—○— *Property determined in "as rolled" condition. Longitudinal to direction of rolling (L-A.R.)*

—△—△—△— " " " " " " *Transverse " " " " (T-A.R.)*

-×—×—×- " " " "heat treated" " *Longitudinal " " " " (L-H.T.)*

-□--□--□- " " " " " " *Transverse " " " " (T-H.T.)*

TABLE I—Mechanical Properties of Test Specimens

Alloy Type	Heat No.	CHEMICAL ANALYSIS, Per Cent					PROCESSING		Direction to Rolling	MECHANICAL PROPERTIES									
										TENSION					COMPRESSION				
		Cr	Ni	Mn	Si	C	Cold Reduction, Per Cent	Heat Treatment		Initial Tangent, E in Million Lb. Per Sq. In.	Proportional Limit, Lb. Per Sq. In.	Yield Strength, 0.2 Per Cent Offset, Lb. Per Sq. In.	Tensile Strength, Lb. Per Sq. In.	Per Cent El. In 2 In.	Initial Tangent, E in Million Lb. Per Sq. In.	Proportional Limit, Lb. Per Sq. In.	Yield Strength, 0.2 Per Cent Offset, Lb. Per Sq. In.	Buckling Strength, Lb. Per Sq. In.	Hardness Rockwell "C"
18-8	13	18.45	8.79	0.50	0.55	0.10	.....	A	L	29	13,300	36,000	94,500	61	28	11,000	36,000	50,250	80*
							.....	A	T	29	16,600	34,000	93,700	61	28	11,000	36,000	50,000	
18-8	E716	17.60	8.87	1.16	0.37	0.11	20	1	L	27	21,000	121,000	139,300	22	26	23,700	74,000	120,400	29
							20	2	L	27	50,000	128,000	141,200	20	28	42,000	94,000	129,400	30
							20	1	T	28	40,000	113,000	138,500	17	27	36,900	121,000	145,000	
							20	2	T	29	55,000	117,000	141,800	14	28	54,000	126,000	147,500	
18-8	13	18.45	8.79	0.50	0.55	0.10	35	1	L	26	53,000	131,000	155,300	15	26	17,100	95,000	151,800	36
							35	2	L	27	60,000	155,000	173,400	11	27	47,600	118,000	158,000	37
							35	1	T	30	56,000	130,000	166,200	11	27	42,700	148,000	183,110	
							35	2	T	31	56,000	147,000	178,700	10	29	72,000	169,000	193,000	
18-8	E716	17.60	8.87	1.16	0.37	0.11	50	1	L	26	40,000	151,000	177,400	6	25	41,000	99,000	155,200	38
							50	2	L	27	63,000	167,000	187,000	5	26	43,000	129,000	168,200	40
							50	1	T	30	50,000	147,000	189,200	8	28	51,000	166,000	166,700	
							50	2	T	31	53,000	164,000	198,300	6	29	65,000	183,000	211,000	
17-7	E572	17.20	7.23	1.28	0.43	0.11	.....	A	L	29	14,000	33,000	117,800	68	28	12,000	40,000	57,800	85*
							.....	A	T	29	15,700	33,000	113,500	62	29	12,000	44,000	57,400	
							10	1	L	28	16,700	67,000	147,600	47	27	12,600	54,000	89,400	32
							10	2	L	28	20,000	65,000	140,900	56	27	21,000	64,000	89,700	32
							10	1	T	28	21,100	72,000	147,100	36	27	22,800	81,000	97,700	
							10	2	T	28	27,000	74,000	140,800	43	27	25,700	74,000	102,000	
17-7	21	17.33	7.14	1.29	0.37	0.13	25	1	L	28	22,000	127,000	165,200	24	26	16,000	96,000	151,400	38
							25	3	L	29	36,000	142,000	167,000	23	28	48,000	119,000	156,100	39
							25	1	T	30	45,000	124,000	170,500	17	28	43,000	143,000	172,200	
							25	3	T	30	60,000	134,000	167,200	18	29	54,000	154,000	177,500	
17-7	E717	17.15	7.17	1.32	0.34	0.11	35	1	L	26	50,000	164,000	196,000	15	26	39,700	139,000	184,500	43
							35	2	L	27	53,000	180,000	198,000	14	27	62,000	161,000	201,200	44
							35	1	T	30	46,400	138,000	201,000	10	27	47,000	185,000	214,300	
							35	2	T	30	61,000	170,000	202,000	10	29	65,000	200,000	218,500	
17-7	E717	17.15	7.17	1.32	0.34	0.11	45	1	L	27	48,000	200,000	225,000	7	26	27,000	163,000	218,000	46
							45	2	L	28	60,000	215,000	235,000	5	27	65,000	193,000	230,000	47
							45	1	T	31	55,000	176,000	234,000	7	29	64,000	230,000	250,000	
							45	2	T	32	76,000	196,000	232,000	5	30	160,000	252,000	272,000	
18-8	13	18.45	8.79	0.50	0.55	0.10	35	1	L	26	53,000	131,000	155,300	15	26	17,100	95,000	151,800	36
							35	3	L	27	60,000	155,000	173,400	11	27	43,000	118,000	157,500	37
							35	1	T	30	56,000	130,000	166,200	11	27	42,700	148,000	183,000	
							35	2	T	31	56,000	147,000	178,700	10	29	71,000	169,000	190,000	
18-7	E852	18.51	7.23	1.32	0.35	0.14	35	1	L	27	39,000	146,000	173,900	17	26	28,000	102,000	167,300	41
							35	2	L	27	56,000	151,000	174,400	14	27	46,000	132,000	177,700	41
							35	1	T	30	58,000	142,000	186,300	14	28	46,000	165,000	200,300	
							35	2	T	30	58,000	152,000	185,500	13	29	75,000	174,000	204,700	
18-6	E851	18.57	6.29	1.30	0.35	0.12	35	1	L	27	54,000	194,000	218,300	14	26	31,000	141,000	208,000	47
							35	2	L	28	64,000	196,000	218,000	13	27	60,000	168,000	219,000	47
							35	1	T	31	54,000	172,000	221,000	12	28	60,000	200,000	234,700	
							35	2	T	31	65,000	176,000	219,000	10	30	106,000	213,000	242,000	
18-5	E882	18.39	5.30	1.32	0.34	0.11	35	1	L	28	52,000	218,000	240,000	9	28	49,000	184,000	228,000	48
							35	1	T	29	64,000	193,000	243,500	6	28	54,000	235,000	257,000	
17-8	E880	17.39	8.11	1.29	0.30	0.11	35	1	L	27	40,000	144,000	179,800	15	25	18,800	116,000	175,600	40
							35	3	L	28	54,000	159,000	181,200	15	27	41,000	142,000	183,100	41
							35	1	T	29	40,000	134,000	190,500	9	28	42,000	164,000	202,000	
							35	3	T	30	40,000	158,000	188,100	7	29	54,000	175,000	199,000	
17-7	E717	17.15	7.17	1.32	0.34	0.11	35	1	L	26	50,000	164,000	196,000	15	26	39,700	139,000	184,500	43
							35	2	L	27	53,000	180,000	198,000	14	27	50,000	161,000	203,000	44
							35	1	T	30	46,400	138,000	201,000	10	27	47,000	185,000	214,300	
							35	2	T	30	61,000	170,000	202,000	10	29	65,000	200,000	218,500	
17-6	E850	17.45	6.28	1.31	0.34	0.12	35	1	L	28	51,000	195,000	229,500	14	26	38,000	171,000	226,300	48
							35	2	L	30	51,000	202,000	225,500	12	28	69,000	190,000	231,500	48
							35	1	T	31	46,000	170,000	224,500	10	28	69,000	208,000	239,500	
							35	2	T	31	60,000	186,000	226,800	9	28	119,000	226,000	250,000	
17-5	E881	17.51	5.31	1.30	0.34	0.12	35	1	L	28	56,000	230,000	245,000	5	26	71,000	208,000	244,000	50
							35	1	T	29	52,000	210,000	254,000	4	28	135,000	251,000	267,000	
18-5-5	H89	18.16	4.59	5.55	0.41	0.13	25	1	L	.....	.....	117,000	177,200	24.5	27	16,000	93,000	.....	.....
							25	3	L	.....	.....	129,000	167,000	29.0	27	41,000	125,000	.....	.....
							35	1	L	.....	.....	147,000	199,300	18.0	27	19,000	117,200	183,200	.....
							35	3	L	.....	.....	159,000	186,200	15.0	27	57,000	157,000	191,100	.....
18-8-2	H100	18.62	2.15	7.90	.....	0.12	25	1	L	.....	.....	127,000	176,800	23	27	16,500	86,000	.....	.....
							25	3	L	.....	.....	145,000	167,000	25	28	39,000	121,000	.....	.....
							35	1	L	.....	.....	146,000	198,200	16.5	.....	41,000	121,000	.....	.....
							35	3	L	.....	.....	172,000	188,200	15	27	54,100	148,000	.....	.....

A = Annealed.
1 = Annealed and cold rolled.
2 = Annealed, cold rolled, heated 72 hr. at 200 deg. C. and air cooled.
3 = Annealed, cold rolled, heated 24 hr. at 275 deg. C. and air cooled.

L = Longitudinal to direction of rolling.
T = Transverse to direction of rolling.
* = Rockwell "B" value.

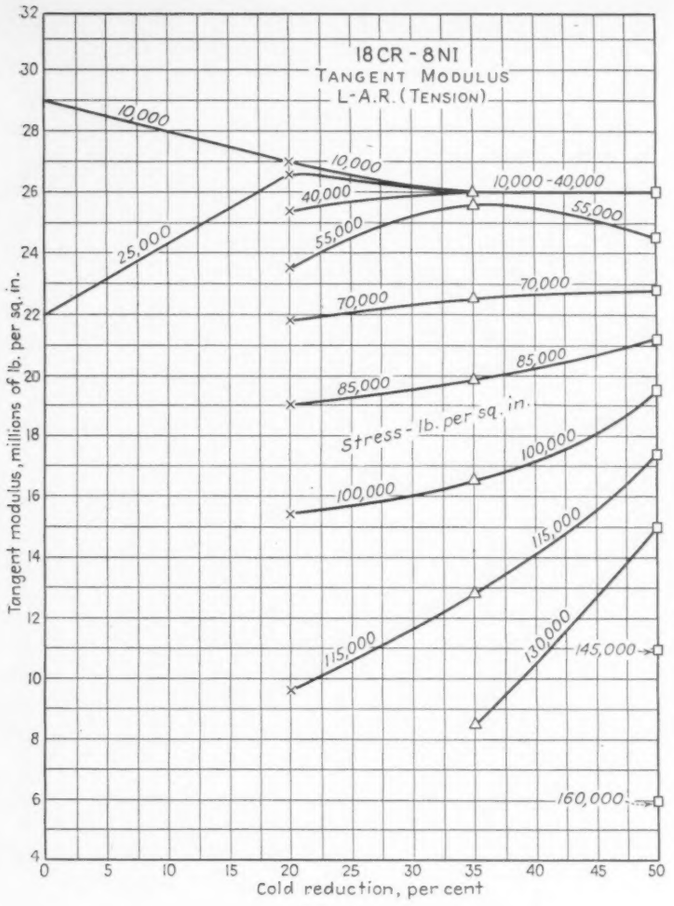


Fig. 9

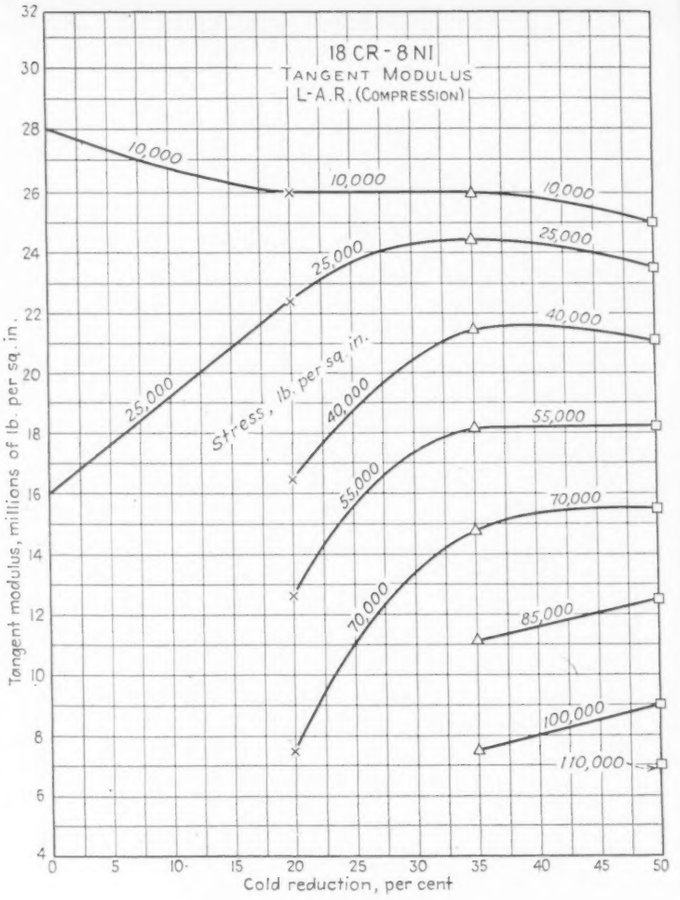


Fig. 10

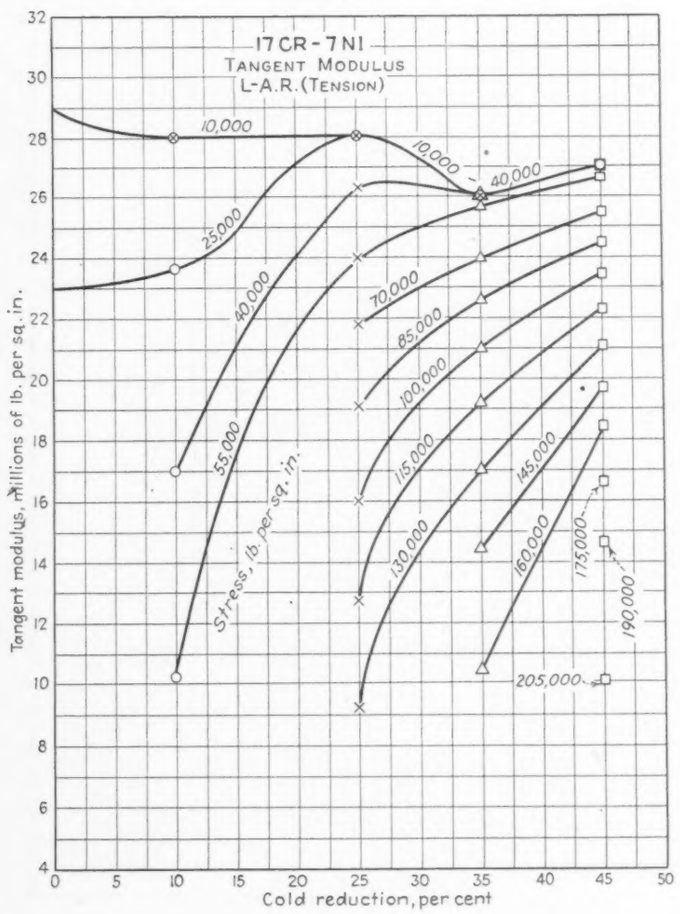


Fig. 11

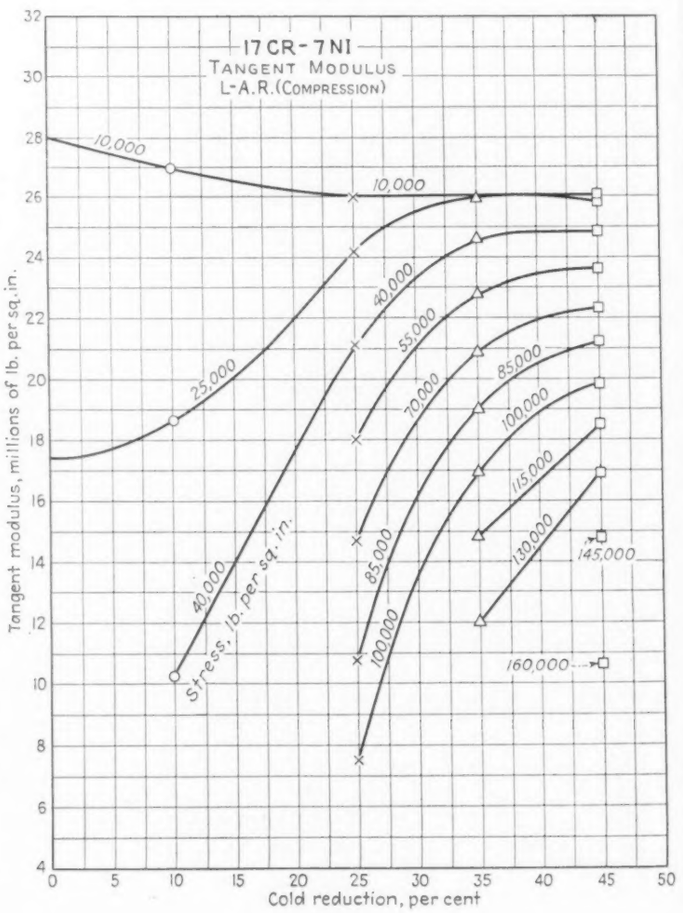


Fig. 12

mined from these stress strain curves.

Alloys Tested

Previous work had shown that the chemistry within the range of the chromium-nickel austenitic steels commercially obtainable appreciably affected their mechanical properties, particularly after cold working. It was also known that this class of alloys exhibited directional properties after cold working and that these properties could be materially improved by a low temperature stress relieving heat treatment. It was, therefore, thought advisable to investigate the longitudinal and transverse mechanical properties with and without heat treatment of an 18 per cent chromium 8 per cent nickel composition, and a 17 per cent chromium 7 per cent nickel composition, after the application of various degrees of cold work. Spot values were also obtained at 35 per cent cold reduction on a series of alloys containing respectively approximately 17 and 18 per cent of chromium in which the nickel was varied from approximately 5 to 9 per cent. Tests to determine the longitudinal mechanical properties after various degrees of cold work were also conducted on two austenitic alloys in which some of the nickel of the 18 per cent chromium 8 per cent nickel composition was replaced with manganese. These alloys were respectively an 18 per cent chromium 8 per cent manganese 2 per cent nickel analysis, and an 18 per cent chromium 5 per cent manganese 4 per cent nickel analysis.

Results of Tests

The results of the tests are tabulated in Tables I and II. Some of the mechanical properties of the 18 per cent chromium 8 per cent nickel, and of the 17 per cent chromium 7 per cent nickel alloys have been plotted against percentages of cold reduction in Figs. 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. These series of curves permit ready comparison of the directional mechanical properties of these two alloys, both with and without heat treatment over a range from annealed high ductility lower strength material, to high strength material of lower ductility.

Discussion of Test Results

In discussing the test results, the general effects of processing on the mechanical properties of 18-8 and 17-7 will first be considered. A comparison of these properties of these two alloys will then be made.

TABLE II

Mechanical Properties of Test Specimens

Alloy Type	Processing: Cold Reduction, Per Cent	Processing: Heat Treatment	Direction to Rolling	Stress, Lb. Per Sq. In.	Tangent Modulus, in Million Lb. Per Sq. In.: Tension	Tangent Modulus, in Million Lb. Per Sq. In.: Compression
18-8	0	1	L	10,000	29	28
				25,000	22	16
	20	1	L	10,000	27.0	26.0
				25,000	26.6	22.4
				40,000	25.4	16.5
				55,000	23.5	12.6
				70,000	21.8	7.5
				85,000	19.0	..
				100,000	15.4	...
				115,000	9.6	...
	35	1	L	10,000	26.0	26.0
				25,000	26.0	24.5
				40,000	26.0	21.5
				55,000	25.6	18.2
				70,000	22.5	14.8
				85,000	19.8	11.1
				100,000	16.4	7.5
				115,000	12.8	...
				130,000	8.5	...
	50	1	L	10,000	26.0	25.0
				25,000	26.0	23.5
				40,000	26.0	21.1
				55,000	24.5	18.3
				70,000	22.8	15.5
				85,000	21.2	12.5
				100,000	19.5	9.0
				115,000	17.4	...
				130,000	15.0	...
				145,000	11.0	...
				160,000	6.0	...
17-7	0	1	L	10,000	29.0	28.0
				25,000	23.0	17.5
	10	1	L	10,000	28.0	27.0
				25,000	23.6	18.6
				40,000	17.0	10.3
				55,000	10.2	
	25	1	L	10,000	28.0	26.0
				25,000	28.0	24.2
				40,000	26.3	21.2
				55,000	24.0	18.0
				70,000	21.8	14.7
				85,000	19.1	10.8
				100,000	16.0	7.5
				115,000	12.7	...
				130,000	9.2	...
	35	1	L	10,000	26.0	26.0
				25,000	26.0	26.0
				40,000	26.0	24.6
				55,000	25.6	22.8
				70,000	24.0	20.9
				85,000	22.6	19.0
				100,000	21.0	17.0
				115,000	19.2	14.8
				130,000	17.0	12.0
				145,000	14.4	...
				160,000	10.4	...
	45	1	L	10,000	27.0	26.0
				25,000	27.0	25.8
				40,000	27.0	24.8
				55,000	26.6	23.6
				70,000	25.5	22.3
				85,000	24.5	21.2
				100,000	23.5	19.8
				115,000	22.3	18.5
				130,000	21.1	16.9
				145,000	19.7	14.8
				160,000	18.4	10.6
				175,000	16.6	...
				190,000	14.6	...
				205,000	10.0	...

1 = Annealed and cold rolled. L = Longitudinal to direction of rolling.

TABLE III—Mechanical Properties of 18-8 and 17-7 as Related to Ductility

Alloy Type	Direction to Rolling	Per Cent Elongation In 2 In.	Cold Reduction Per Cent		Tensile Strength, Lb. Per Sq. In.		Tensile Yield Strength, Lb. Per Sq. In.		Compressive Yield Strength, Lb. Per Sq. In.	
			1	2	1	2	1	2	1	2
18-8	L	7.5	48.5	43.5	175,000	182,000	148,500	162,500	99,000	125,000
	L	10.0	43.5	37.0	167,500	174,000	142,000	157,000	98,500	120,000
	L	15.0	33.5	27.0	153,500	157,000	131,000	144,000	93,000	107,000
	L	20.0	23.5	20.0	142,500	143,000	122,000	128,000	80,000	94,000
	L	25.0	16.0	15.0	133,500	132,000	113,000	111,000	67,500	82,000
	L	30.0	12.0	11.5	124,500	123,500	99,000	97,000	60,000	72,000
	L	61.0	0.0*	0.0*	94,500*	94,500*	36,000*	36,000*	36,000*	36,000*
17-7	L	7.5	44.5	42.0	223,000	224,000	199,000	206,000	162,000	185,000
	L	10.0	41.0	39.5	212,000	214,000	186,000	197,000	156,000	177,000
	L	15.0	35.0	33.5	194,000	193,000	164,000	173,000	139,000	155,000
	L	20.0	29.0	28.0	177,000	176,000	142,000	150,000	112,000	131,000
	L	25.0	24.0	23.0	165,000	163,000	123,000	127,000	92,000	111,000
	L	30.0	20.0	20.0	158,000	157,000	107,000	114,000	79,000	99,000
	L	61.0	3.0	6.0	131,000	133,500	42,500	55,000	43,000	53,500

1 = Annealed and cold rolled.
2 = Annealed, cold rolled and heat treated.
L = Longitudinal to direction of rolling.
* = Annealed.

Lastly, the importance of chemistry will be discussed.

It will be noted from the curves of Figs. 3, 4, 5, 6, 7 and 8 that the annealed material exhibits little, if any, directional effects.

However, it will be noted in Figs. 3 and 4 that after cold rolling the transverse ultimate tensile strengths of 18-8 are somewhat greater than the comparable longitudinal values and that the low temperature heat treatment improves this property. The ultimate tensile strengths of 17-7 do not exhibit marked directional effects or response to the low temperature heat treatment.

Figs. 5 and 6 show that the greatest tensile yield strengths for the two alloys after cold rolling are obtained in the longitudinal direction and that considerable improvement is obtained in this property by heat treatment. These figures also show that somewhat greater ductility is obtained in the longitudinal direction.

It can be seen from Figs. 7 and 8 that the greatest compressive yield strengths of 18-8 and 17-7 after cold rolling are obtained in the transverse direction and that there is considerable improvement in these properties by the application of the low temperature heat treatment.

The data tabulated in Table I also show that the low temperature heat treatment quite generally improves the initial modulus both in tension and compression.

Having considered the general effects of processing on the mechanical properties, let us compare the 18-8 and 17-7 analyses. In order to compare the mechanical properties of these two alloys, a reference property must be selected and the values of the other properties noted as this selected basis is varied. A number of such bases suggest themselves. However, regardless of the mechanical properties that might be obtained in any material, commercially the prime requisite is that it have sufficient ductility to insure adequate fabricating properties for the intended application. It is then considered practical and expedient to select ductility as a reference property and compare the values of the other mechanical properties that can be obtained as this reference is varied.

It has been noted that both of these alloys exhibit their greatest compressive yield strength transverse to the direction of rolling. However, in order to utilize fully the properties in this direction, sections made from strip must be fabricated in such manner that the maximum length of the section is approximately the maximum width of the rolled strip. This limits the length of such sections. In order to avoid this limitation and make the discussion more broadly applicable, the longitudinal properties only will be discussed. The transverse compression properties, however, should

(CONCLUDED ON PAGE 162)

TABLE IV

Comparison of Longitudinal Tangent Modulus in Tension and Compression

Alloy Type	Direction to Rolling	Per Cent Elongation In 2 In.	Cold Reduction Per Cent	Stress, Lb. Per Sq. In.	Tangent Modulus, in Million Lb. Per Sq. In.	
					Tension	Compression
			1		1	1
18-8	L	10	43.5	10,000	26.0	25.6
				40,000	26.0	21.5
				70,000	22.7	15.5
				100,000	17.8	8.3
				130,000	12.0	...
18-8	L	20	23.5	10,000	26.8	26.0
				40,000	25.6	18.2
				70,000	22.0	10.0
				100,000	15.6	...
				130,000	...	...
18-8	L	30	12.0	10,000	27.8	26.6
17-7	L	10	41.0	10,000	26.6	26.0
				40,000	26.6	24.8
				70,000	24.9	22.1
				100,000	22.6	19.2
				130,000	19.5	14.9
17-7	L	20	29.0	10,000	27.5	26.0
				40,000	26.4	23.0
				70,000	22.8	18.0
				100,000	18.8	12.6
				130,000	13.6	...
17-7	L	30	20.0	10,000	28.0	26.2

1 = Annealed and cold rolled.

CYCLONE ENGINES MASS PRODUCED

By HORACE E. LINSLEY
Production Engineering Department, Wright Aeronautical Corp.

THE fact that a large number of aircraft engines of a single model are to be built each month at the new Cincinnati plant of Wright Aeronautical Corp., just getting into production at Lockland, Ohio, has enabled the company to go much farther in adopting mass production methods and special-purpose tooling than has been warranted heretofore in the aircraft industry. In fact, the particular group of automatic high production machines described in detail in this article are conceded by many automotive production executives to be ahead of anything of the kind in use in that industry today.—Ed.

UNTIL a very short time ago, it had not been practical to apply mass production machines to aircraft engine production for the reason that there were frequent design changes and many models to manufacture, none of which were manufactured in large lots as compared with automotive production. However, with the tremendous increase in production required for defense purposes, mass production machines and methods are now being applied on as many parts as is practical, always keeping in mind a possibility that there will be engineering and model changes and that such special machines as are adopted must be so designed and constructed that tooling changes can be made at a minimum of cost.

The policy of using special machines wherever studies show such applications to be practical and profitable has the following advantages:

(a) In most cases the original cost is less than would be required for a sufficient number of standard machines for equal production, or where it is not, the difference may be "written off" in a relatively short time as a result of lowered costs.

(b) By using special machines in which all the skill and ingenuity and checking devices have been built, not only is the required number of operators reduced, but it is also possible to use semi-skilled boys who are trained by special courses in the several training schools the company has set up. This reduces the number of highly skilled men required, the supply of which is very limited, making it possible to assign them to more important work of setting-up operations and keeping high production machines in operation.

(c) By the reduced number of machines required, the load on the already overloaded machine tool industry is greatly reduced.

(d) All of these conditions will result in decreased cost and improved quality of the product, and when normal competition returns, the Wright company should be in the best possible position to retain its leadership.

Some two years ago, the Wright company was producing a maximum of 250 engines a month of several different types and naturally such an output could not justify the employment of high production machines, which would of necessity have stood idle for the greater part of the time. With the outbreak of hostilities in Europe, however, the demand for Wright engines grew to such proportions that it became necessary to change many machining operations over from what amounted to a job-lot basis to semi-production methods and to adopt more elaborate tooling to meet the

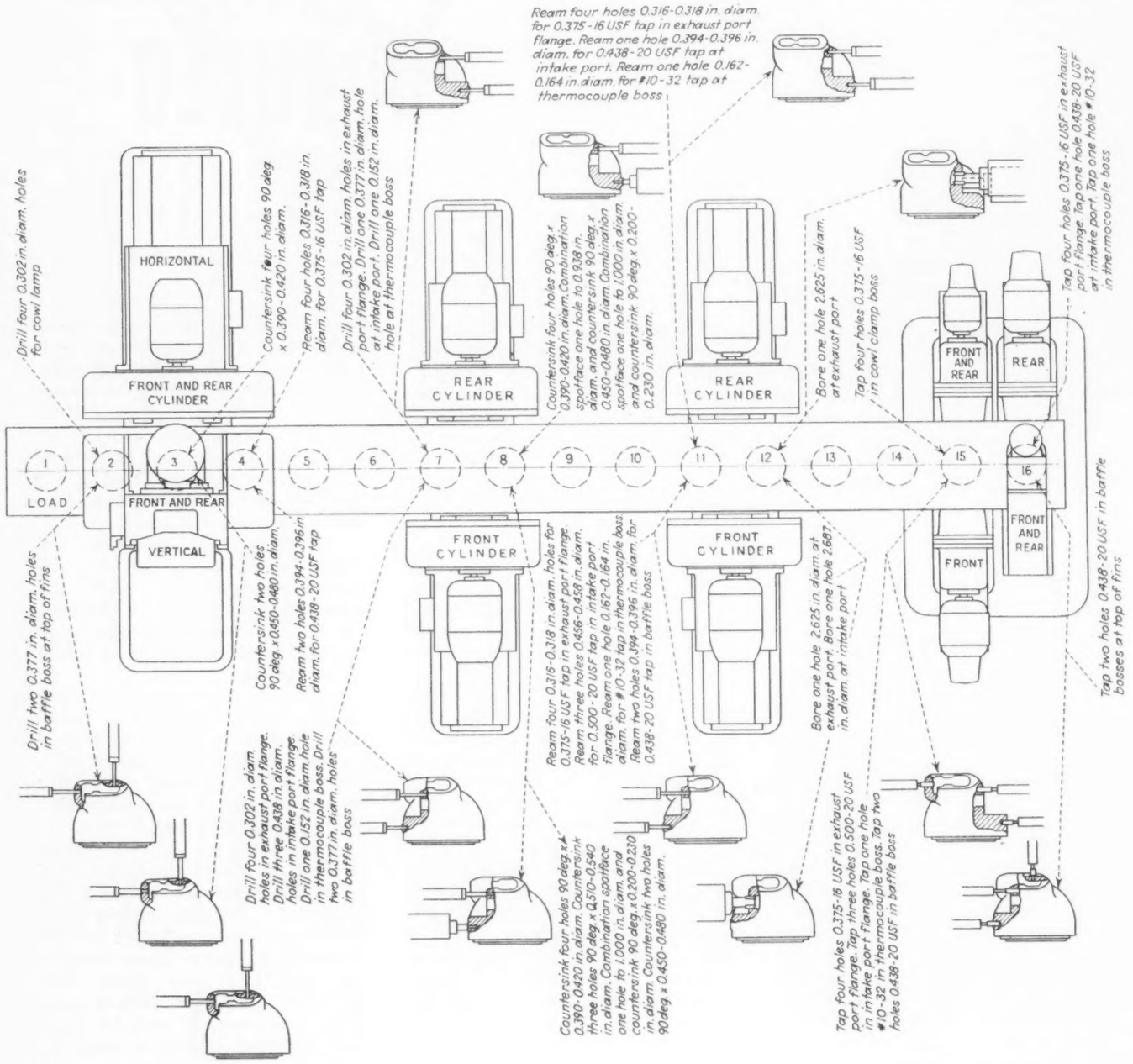
sudden emergency. Then last fall, when our own government stepped up the projected output of airplanes enormously, the way was paved for going to full mass production methods. This condition is particularly true for the new Cincinnati plant now being set up for the production of great quantities of engines of a single type—the R-2600B Cyclone, a double-row, 14-cylinder engine developing 1700 hp.

Multi-Station Transfer Machines

Of all of the equipment provided for this giant plant, perhaps the most remarkable are the group of Greenlee multiple station, straight line automatic transfer machines in which drilling, reaming, counterboring, countersinking, spotfacing and tapping operations are performed on the aluminum cylinder heads both before and after assembly to the steel barrels. Each of these three machines is in itself a production line. Years of experience in the building of special way-type multiple spindle drilling, boring and tapping machines for the automotive industry have gone into these machines, and their use in the present form marks a high-spot in the evolution of modern machining methods.

The first of these units, shown diagrammatically in Fig. 1, is a 16-station machine that performs no less than 25 different operations on the front cylinder head, employing a total of 64 separate tools, and a total of 20 operations on the rear cylinder head, using 47 tools. The second machine, shown in the photograph, Fig. 2, and diagrammatically in Fig. 3, has 56 stations and performs 46 operations on the front head, using 70 tools, and 37 opera-

FIG. 1—Diagrammatic sketch of the first of three Greenlee multiple station, straightline automatic transfer machines for performing a number of related operations on aluminum cylinder heads for the Wright 14-cylinder double row engine. The work, mounted on special carrier plates, is transferred from station to station automatically.



tions on the rear head with 61 tools. The third machine of this group comes into use after the cylinder heads and barrels have been finished as details and have been assembled into single units.

In effect, the first two machines should be considered as one unit since the parts pass directly from one to the other, with only a washing operation between. Hence, the total time in the two machines, which is about an hour, is immaterial. What really counts is that with the Greenlee machinery, one completed head comes off the end of the production line every 45 sec. This time will probably be reduced as more experience is obtained with the equipment.

Comparative First Costs

To obtain an equivalent production with the methods employed two years ago would have involved the procurement of no less than 60 individual machines at a cost of $173,500 and would have necessitated the employment of 162 men for three-shift operation. Even with the use of semi-production machines such as are now in use at the Paterson plant, 39 machines would have been required, at a cost of $153,000 and 105 men would have to be hired and trained to operate these machines. To operate this Greenlee equipment on a three-shift basis, only 24 men are needed, of whom at least 20 will be unskilled, whereas all the operators for either the low or the semi-production machine tools must be at least semi-skilled and a considerable proportion of skilled set-up men must be included. The cost of the first two Greenlee machines mentioned amounts to $230,000, representing an increase of $77,000 over the semi-production type, but it is estimated that this difference will be made up in one and one-half months at peak production. Another important fact is that these two machines occupy less than 3000 sq. ft. of floor space as against more than 7000 required for the low or semi-production equipment.

For the third Greenlee machine, only 15 men will be required for three shifts and of these only six require to be fully skilled (set-up men), the remaining nine being unskilled. The methods currently in use at the Paterson plant for operations on the assembled heads require the use of nine machines and 39 men on a three-shift basis. Of these, four must be fully skilled and the remainder at least semi-skilled.

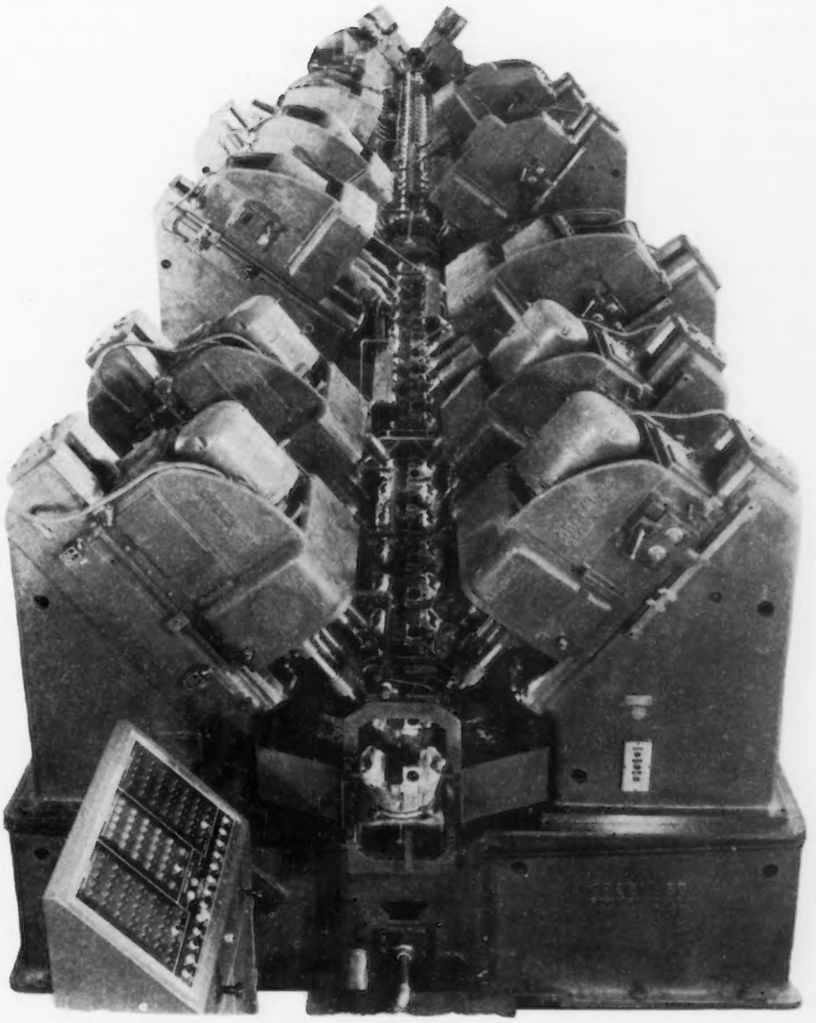


FIG. 2—Looking down the transfer conveyor line of the second Greenlee automatic machine. This group of machines whose operations are synchronized as a unit is controlled from the central pulpit board seen in the left foreground. If any unit fails to function properly, signal lights on the panel quickly locate the unit at fault.

Although performing a variety of different machining operations, all these Greenlee machines have certain factors in common. In the first place, the individual units of each group are fundamentally unit head, way type drilling, reaming, boring and tapping machines, familiar to the automotive industry, particularly on so-called cylinder block production lines. There are a number of important distinctions, however, to be noted. For one thing, in a cylinder block line, although the machines are arranged so that the work progresses down the line from one machine to another in succession, the work must be pushed by hand along a roller conveyor between machines and must be loaded and clamped by the operator at each machine or station. In the Greenlee equipment, on the other hand, as many as 11 single and double way machines function in an interlocked system. The work progresses from station to station automatically and is clamped at each station automatically. To do this effectively, resort has been made to the use of carrier locating plates onto which the work is securely clamped before being placed at the loading station of each group. Considerable experimenting had to be done, incidentally, to obtain a simple and rapid means of clamping that would not distort the aluminum castings,

which have a relatively low elasticity.

Cycles Interlocked

The next important difference is that every station is hydraulically and electrically interlocked so that the machine becomes inoperative if all the work carriers are not clamped properly at each work station, if a head jams or a tool breaks or if the functions of each cycle are not completed in the proper sequence. A full cycle consists of engaging locating dowels carried on hydraulic clamping platens (elevated from below) with the dowel holes in the carrier plates, hydraulic clamping, rapid advance of the unit heads to the work, feed (two rates of feed used for facing operations) dwell, rapid withdraw, unclamp work plates and withdraw dowel pins so that work may be indexed transversely to the next station. Unit heads are fed hydraulically, with the exception of those heads performing tapping operations in which case leadscrews are employed for feed. The transfer mechanism is operated hydraulically, consisting of a long bar coupled solidly together in several sections and having latch hooks which pick up the carrier plates on the forward stroke and leave them stationary on the return stroke. Stations are on 16 in. centers.

Should the machine fail to start due to an incompleted cycle, the location of the fault is readily discoverable by pressing a button on the master control panel, seen to the left of the loading station in Fig. 2. The failure of any lamp to light on the control panel board will indicate the station at which the trouble has occurred and also the particular function which has not been completed.

As the diagrams and the photographs show, these machines are actually designed and set up as individual two way units, each head carrying a multiplicity of spindles and serving anywhere from one to three work stations at each traverse cycle of the heads. These individual units are bolted to the floor independently and are tied together mechanically only by the transfer bar and connecting bridges which have two rows of wheel conveyors over which the work carrier plates slide. An open space of two idle units is left between each machine group to permit the operators and inspectors to reach and adjust the individual tools. In a few places, inspection fixtures are placed at these idle stations. Once every station is occupied by a work piece and carrier, the fact that blank spaces occur between machine units does not affect the machine group output, which is governed by the time it takes to perform the longest operation. This is 45 sec. and one completed part is removed from the end of the transfer line at each indexing of the bar. Any unit may be removed or made inoperative during a change in model or should a mechanical defect necessitate repair or replacement. Similarly, additional units may be incorporated to take care of additional operations simply by opening up the transfer bar at one of its joints and inserting a new section of suitable length. The new units may then be placed in position and coupled to the electric and hydraulic systems. This procedure involves, of course, the unbolting of certain machines from the floor and shifting them further down the line.

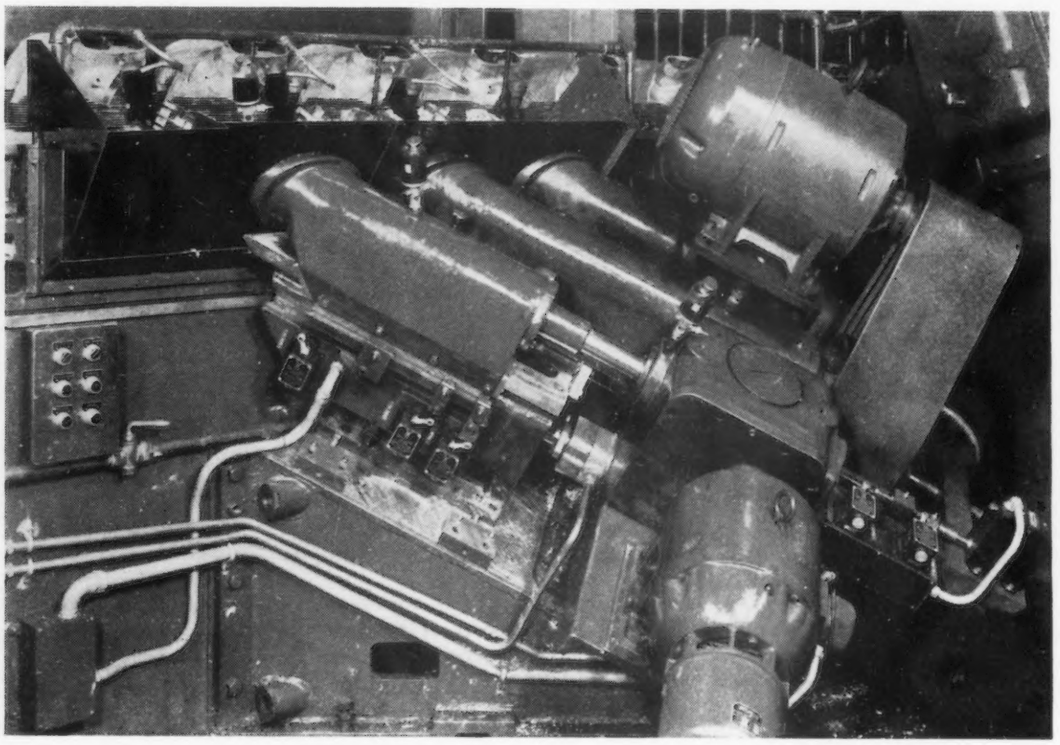
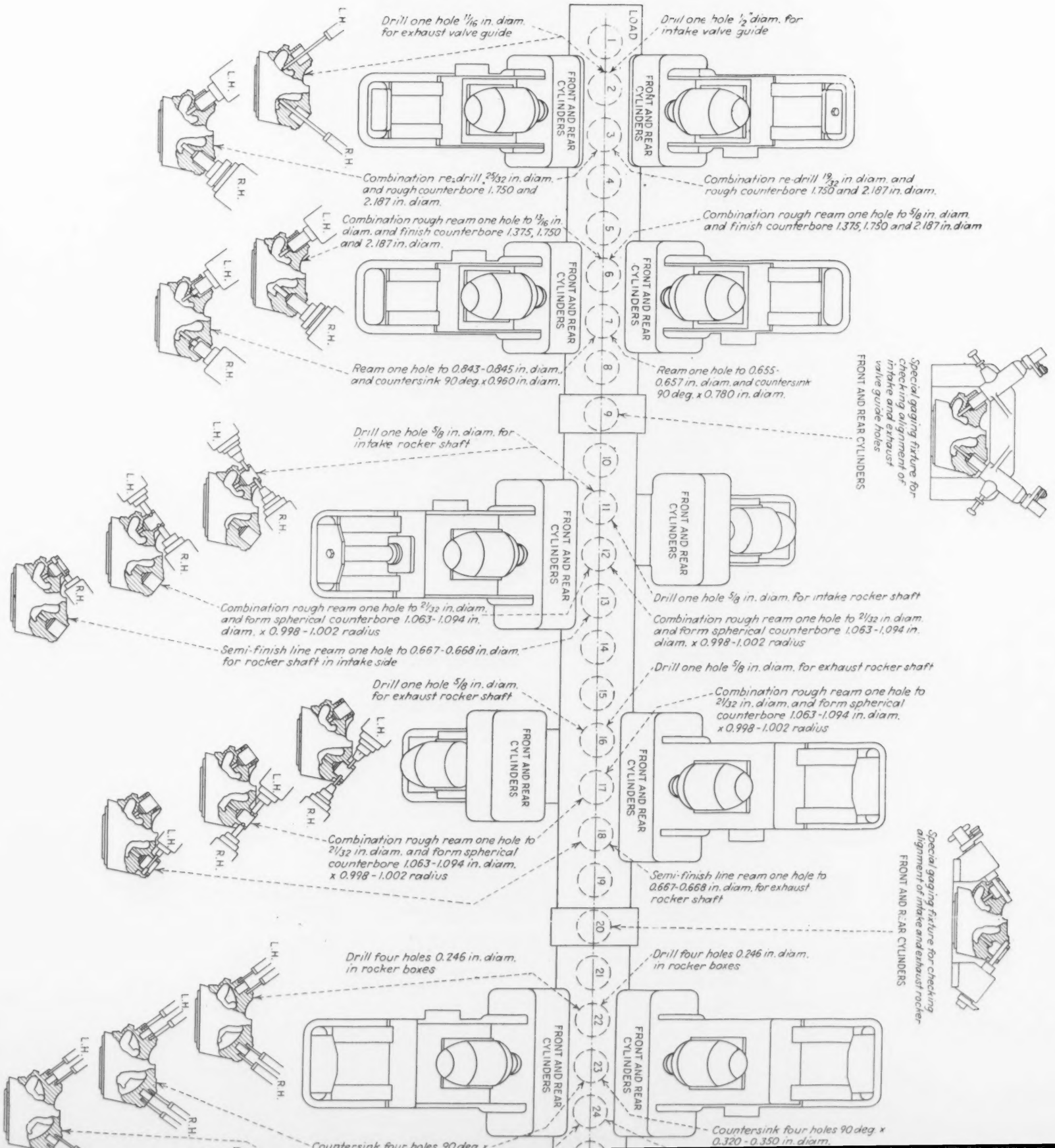


FIG. 4 — The nature of the job to be done determines the position of the spindles and unit heads. This is a close-up of the double angular heads working at stations 48, 49 and 50, diagrammed on opposite page. Snap-Lock limit switches for depth feed control and a magnetic brake on the motor in the foreground govern the movement of the large tapping head, which is fed by a lead screw.

Rigid Construction

Several features have been incorporated into the machines to assure the required accuracy for aircraft engine work. Ways are hardened and ground steel to minimize wear. Extra large work spindles and anti-friction bearings are used


LOAD
1
2
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16
17
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19
20
21
22
23
24
FRONT AND REAR CYLINDERS
L.H.
R.H.
Drill one hole 11/16 in. diam. for exhaust valve guide
Drill one hole 1/2" diam. for intake valve guide
Combination re-drill 25/32 in. diam. and rough counterbore 1.750 and 2.187 in. diam.
Combination re-drill 19/32 in. diam. and rough counterbore 1.750 and 2.187 in. diam.
Combination rough ream one hole to 13/16 in. diam. and finish counterbore 1.375, 1.750 and 2.187 in. diam.
Combination rough ream one hole to 5/8 in. diam. and finish counterbore 1.375, 1.750 and 2.187 in. diam.
Ream one hole to 0.843-0.845 in. diam., and countersink 90 deg. x 0.960 in. diam.
Ream one hole to 0.655-0.657 in. diam. and countersink 90 deg. x 0.780 in. diam.
Special gaging fixture for checking alignment of intake and exhaust valve guide holes FRONT AND REAR CYLINDERS
Drill one hole 5/8 in. diam. for intake rocker shaft
Combination rough ream one hole to 21/32 in. diam. and form spherical counterbore 1.063-1.094 in. diam. x 0.998-1.002 radius
Semi-finish line ream one hole to 0.667-0.668 in. diam. for rocker shaft in intake side
Drill one hole 5/8 in. diam. for exhaust rocker shaft
Combination rough ream one hole to 21/32 in. diam. and form spherical counterbore 1.063-1.094 in. diam. x 0.998-1.002 radius
Semi-finish line ream one hole to 0.667-0.668 in. diam. for exhaust rocker shaft
Special gaging fixture for checking alignment of intake and exhaust rocker FRONT AND REAR CYLINDERS
Drill four holes 0.246 in. diam. in rocker boxes
Countersink four holes 90 deg. x 0.320-0.350 in. diam.

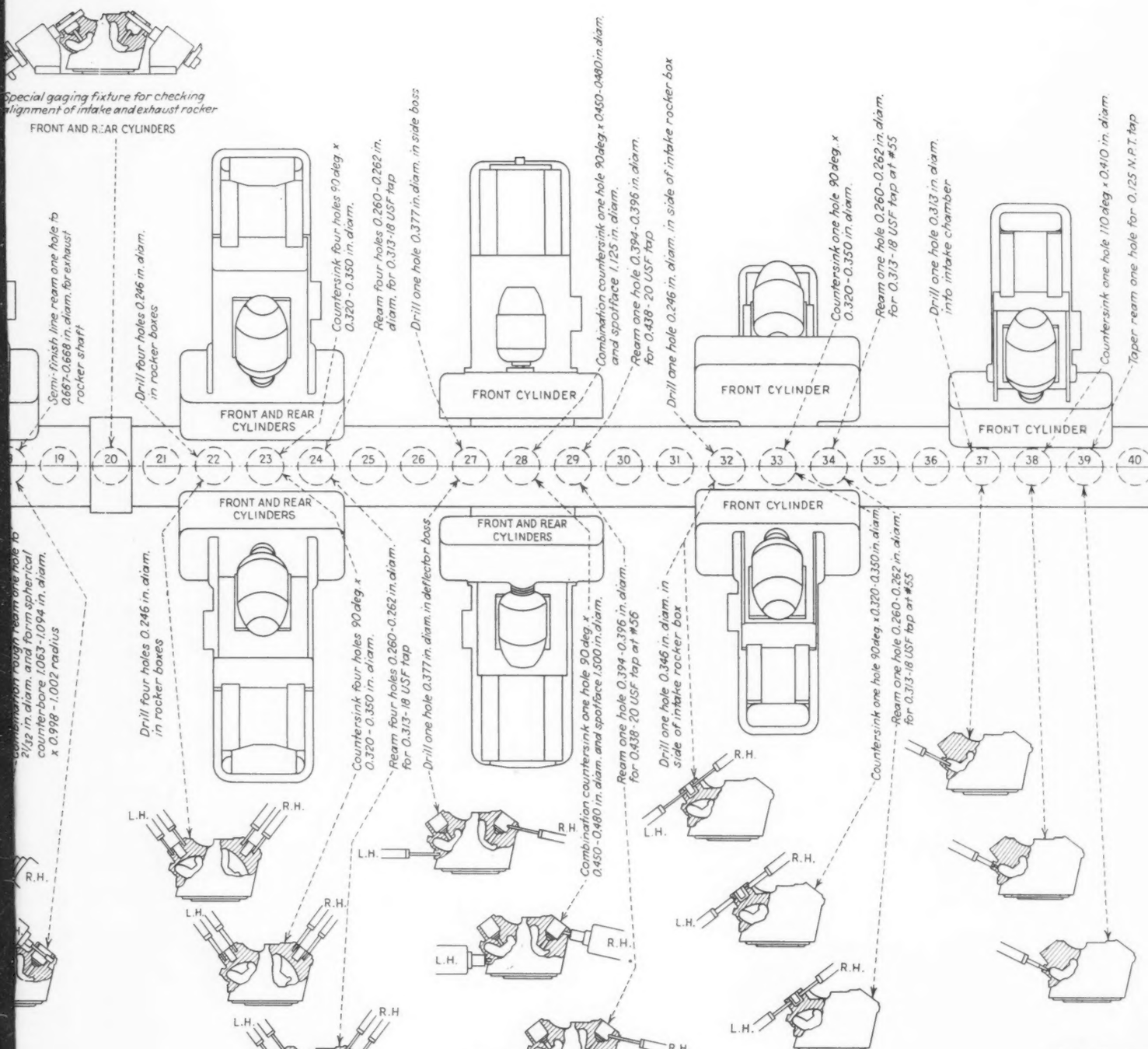

FIG. 3-
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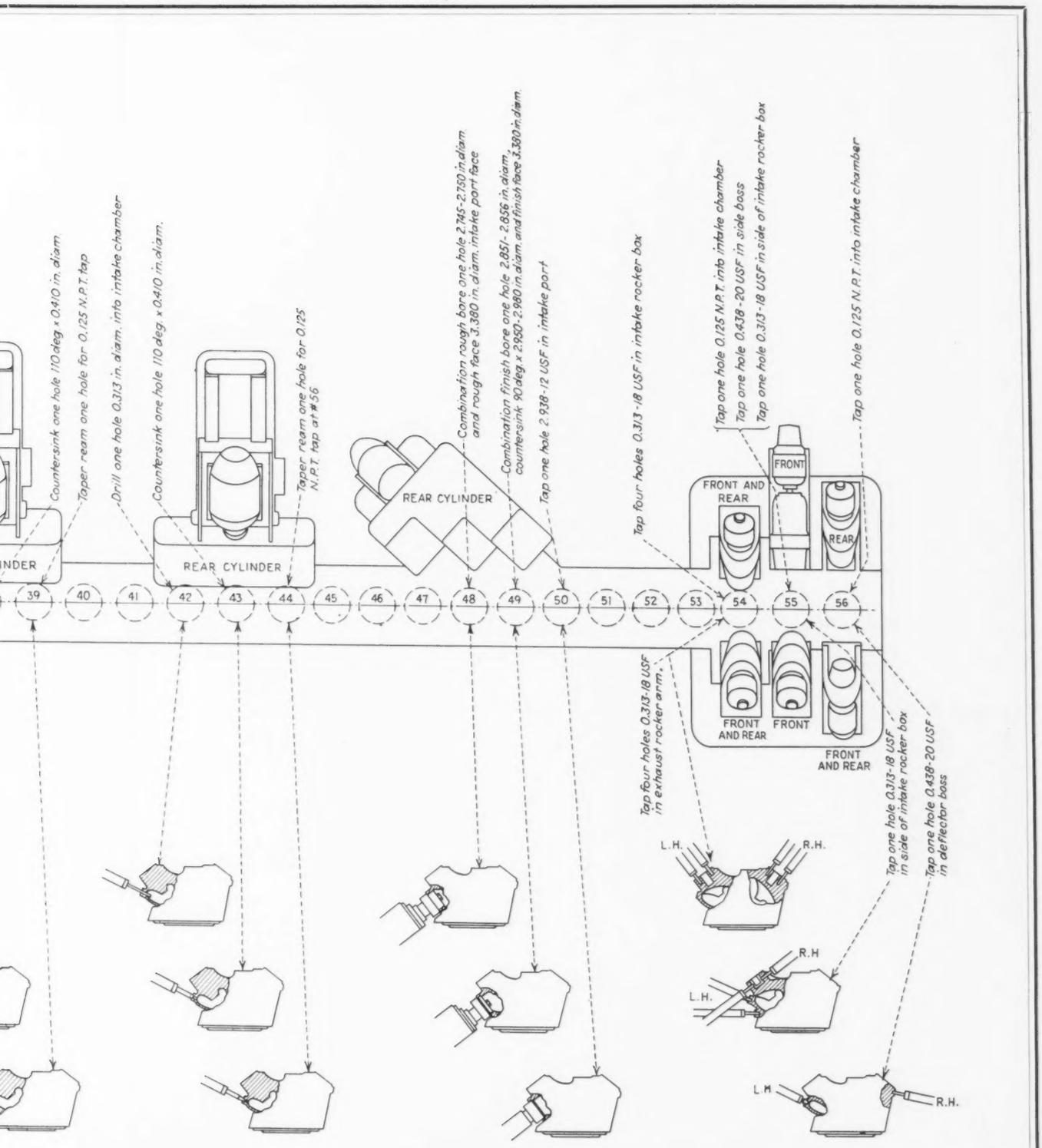

FIG. 3—Diagrammatic sketch of the second Greenlee machine, pictured in Fig. 2. This 56-station machine, installed at the new Cincinnati plant of the Wright Aeronautical Corp., is about 73 ft. long and is comprised of 11 way type machines of either single or double head. Most of the heads are set at an angle, perpendicular to the surfaces of the rocker arm bosses. One finished part drops off the end of the line every 45 sec.

and the tool overhang is reduced to a minimum. By the nature of the work and the transfer mechanism, the use of end piloted tools is not possible so that great rigidity must be built into the tools and spindles. Jig plates are used, however, to guide drills and reamers. The sketches of the various operations show how this principle has been interpreted in terms of spindle noses and tool overhang.

All the tooling on these machines was supplied by the Gairing Tool Co., Detroit. Except for taps, small diameter reamers and drills, all the tools are carbide tipped to lengthen tool life between grinds. Tool changeover is no more difficult than on standard way type machines and the distribution of the various units along the floor provide ample access to the spindles for this purpose.

The electrical control equipment is contained in a bank of separately inclosed panels at a safe distance from the machine line. The moisture and dust-proof housings are a splendid example of the most modern practice in machine tool control wiring and panel construction and is indicative of the great amount of care and forethought built into it. All motor contractors and hydraulic circuit valve control relays are mounted on the front of the panel and all wiring is neatly arranged on the back side. Interconnection of the units is effected from the front, however, through terminal posts brought out to the front at the lower part of each cabinet, much like a telephone switchboard. The whole design is intended to keep factory dust and coolant spray from affecting any of the sensitive contact points, which are silver to silver. To reduce arcing, the entire relay control system is operated on a 110-volt a.c. circuit. Bringing all the controls to one area (the group runs half the length of any one machine) has involved an immense amount of wiring, close to 5 miles total for the 56-station machine alone. Some of the controls are on the machines themselves, such as Snap-Lock limit switches for governing unit head movements. Besides, push button stations at each unit permit individual operation during set-up.

The first two machines include a total of 40 electric motors with a combined rating of 190 hp., motors that range from ½ to 15 hp. each. To avoid electrical shock to the shop feeder system at this point and possible reduction of voltage and throwing out of other motors on the same line should all 40 motors be started at once, an automatic timing device has been incorporated into the control system so as to start the various motors at intervals of 2 sec. or more in a definite cycle. The timer may be adjusted to vary this interval as required. The third machine with its total of 19 motors totaling 69 hp. is similarly controlled.

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THE main Cincinnati plant of the Wright Aeronautical Corp. in which the machines described in these pages are installed is the largest single-story structure in the country, measuring 1064 ft. wide by 1320 ft. long. It, as well as the offices, is completely air conditioned, being cooled in summer by an ice plant capable of producing 6000 tons of ice every 24 hr. Generally speaking, the flow of production will be from rough stores at the front of the building toward the rear of the structure through a series of production lines, grouped by key engine parts. As an example, one line of machine tools finishes cylinder barrels, from rough forgings at one end to finished barrels at the other. In other sections of the plant, cylinder heads, gears, cams supercharger housings, rear covers, nose sections and other parts move down the length of the big floor, each headed for final inspection and the assembly floor. Many major parts, like pistons and crankcases, are being made on the outside by sub-contractors.

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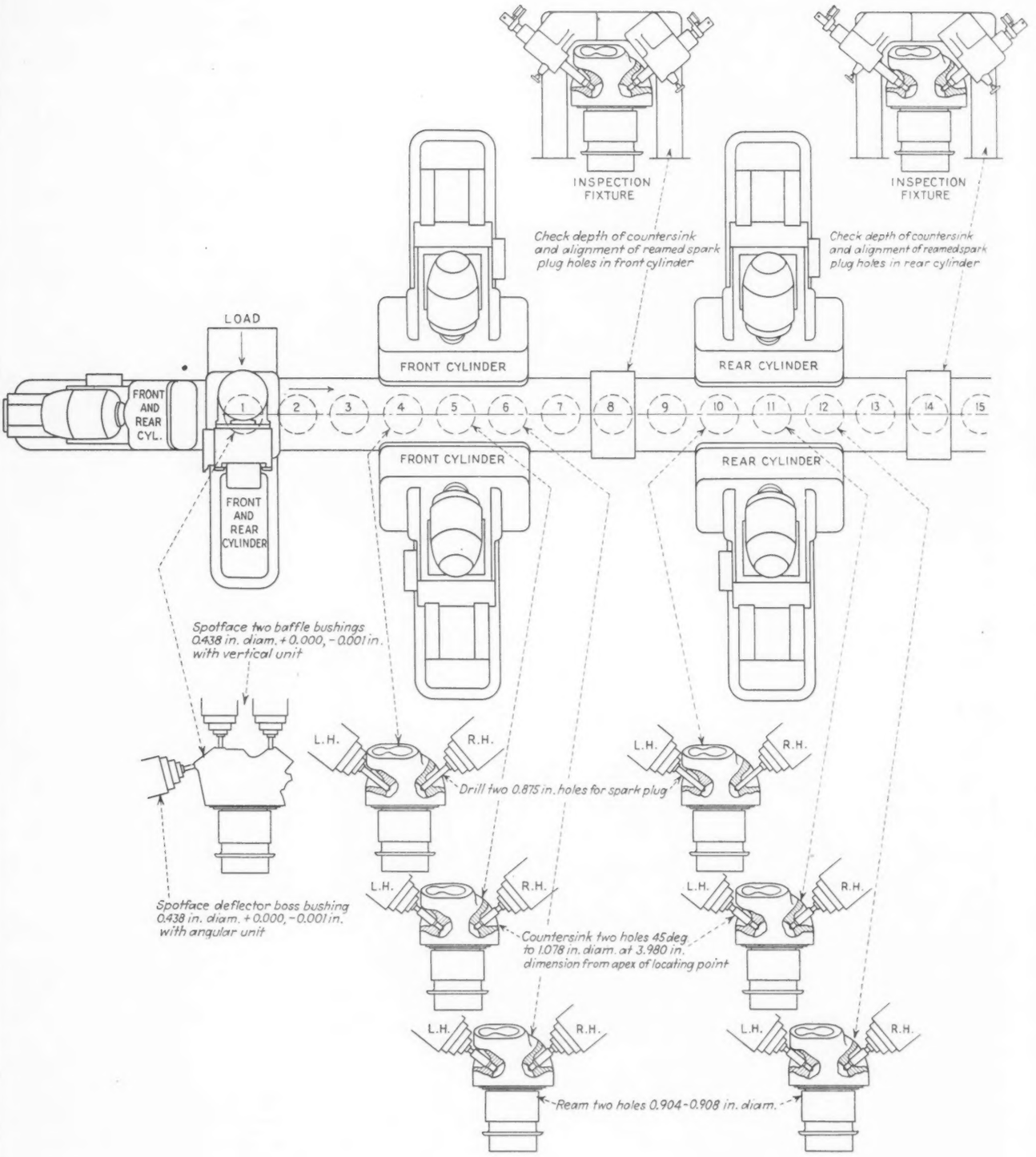
Each machine is equipped with its own centralized coolant system. Individual controls are incorporated on each distribution pipe, however, so that the coolant will flow only while a unit is operating. Withdrawal of the spindles automatically stops the flow of coolant. Special attention was given to chip disposal in the design of the fixtures and clamping devices so that the chips will be carried clear of the work and to accessible screens through which the coolant drains to a central tank. For the 56-station machine, the coolant drainage tank, located in a pit in the floor about midway of the 73 ft. length of the machine, has a capacity of 1650 cu. ft., with 18 cu. ft. for chip collection. The pumps handle 550 gal. of coolant per min. For cutting aluminum a 24:1 mixture of mineral seal oil and a sulphurized mineral oil is used. In appearance, this is a translucent oil of fairly low viscosity.

How They Operate

The diagrammatic layouts of the three machine groups give all the details of the individual operations at each station. It will be noted that some of the unit way heads perform operations on either the front or the rear heads and some on both. Obviously, only one type of head is sent through the machine at any one time. Changeover from operations on one head to the other is practically instantaneous, being merely a matter of depressing a group of buttons on the main control panel at the head of the machine. Before any work can be done on the first machine group, certain preliminary turning and boring operations are necessary on the open end of the head casting to prepare a locating seat for the carrier plates and then a locating hole is accurately drilled and reamed in the flange for angular positioning. The head is then mounted and securely clamped on the locating plates on which they remain while certain face milling operations are performed on the rocker box flanges in which holes are later drilled, reamed and tapped in the Greenlee machines. Still on the same plates, the parts are loaded at station 1 of the first group, Fig. 1, and are conveyed automatically to the first operation at station 2. They then go down the line, station by station, until station 16 is reached. If the heads for the front row of cylinders are being run, three of the left-hand heads are inoperative, namely those serving stations 7, 8, 11, 12 and 16. If rear heads are being run, the right hand units at stations 7, 8, 11, 12 and 15 are inoperative.

After leaving the last station the


INSPECTION FIXTURE
INSPECTION FIXTURE
Check depth of countersink and alignment of reamed spark plug holes in front cylinder
Check depth of countersink and alignment of reamed spark plug holes in rear cylinder
LOAD
FRONT CYLINDER
REAR CYLINDER
FRONT AND REAR CYL.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
FRONT CYLINDER
REAR CYLINDER
FRONT AND REAR CYLINDER
Spotface two baffle bushings 0.438 in. diam. + 0.000, - 0.001 in. with vertical unit
L.H.
R.H.
Drill two 0.875 in. holes for spark plug
Spotface deflector boss bushing 0.438 in. diam. + 0.000, - 0.001 in. with angular unit
Countersink two holes 45 deg to 1.078 in. diam. at 3.980 in. dimension from apex of locating point
Ream two holes 0.904 - 0.908 in. diam.

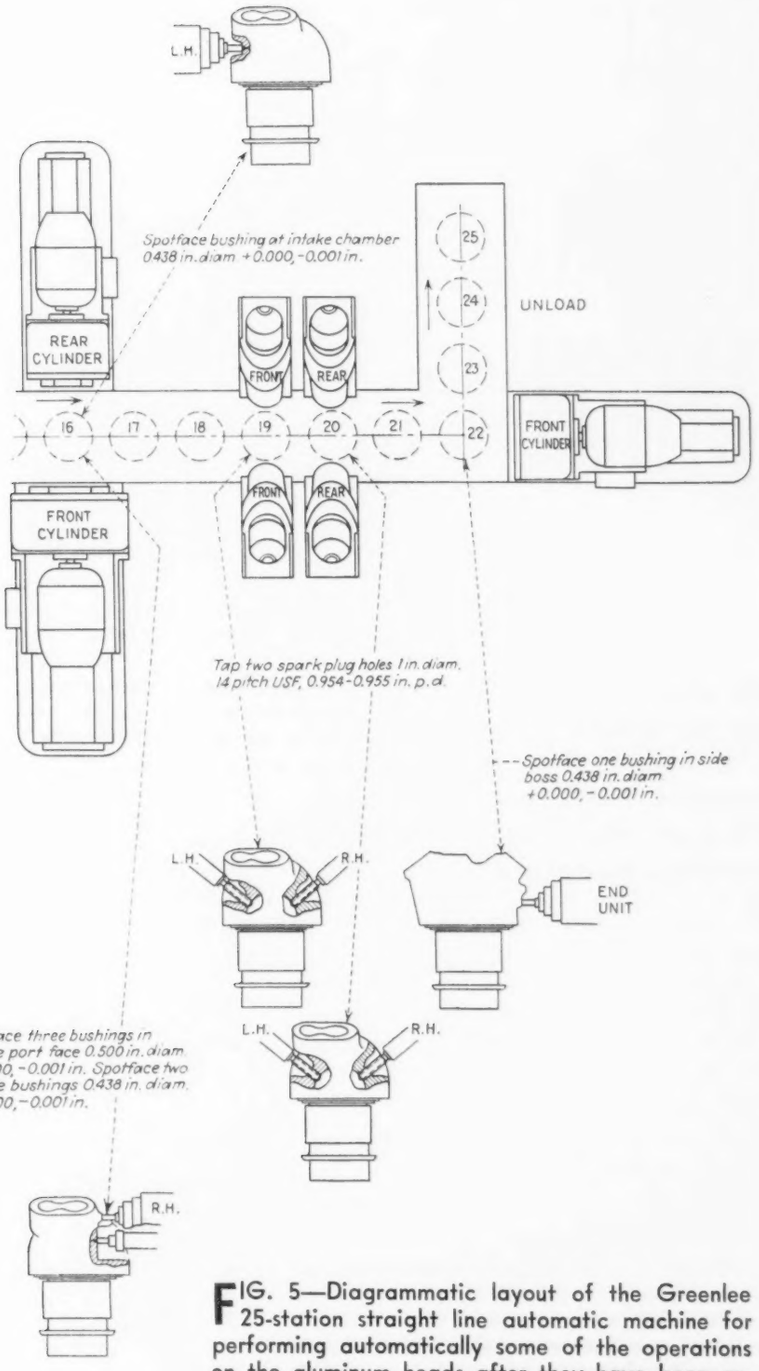


FIG. 5—Diagrammatic layout of the Greenlee 25-station straight line automatic machine for performing automatically some of the operations on the aluminum heads after they have been assembled to the steel cylinder barrels. Only 15 men will have to be trained to operate this machine as against 39 on more conventional equipment.

heads, still on the transfer plates, are put through a washing machine where oil and chips are quickly removed. As they leave the washer, the plates are turned around 90 deg. so that the side faces are presented to the tools in the next machine which comprises the 56 stations. As before, the heads are then loaded at station 1 and pass down the line automatically. It will be noted that on this machine, Fig. 3, two inspecting stations are provided. At station 9 the alinement of the intake and exhaust valve guide holes is carefully checked and at station 19 the alinement of the rocker shaft holes is checked, in both instances by inserting plungers from appropriate positions on the inspection fixtures.

Operations carried on at stations 48, 49 and 50 are interesting in that the heads are set at a double angle. The three heads, pictured in Fig. 4, successively rough bore and face, finish bore, countersink and face and finish tap the intake port opening in the rear cylinder head. There is no corresponding group of operations on the front heads.

The third machine of the group, Fig. 5, comes into use after the cylinder head and barrel have been finish machined as details and have been assembled into a single unit. As for the other machines, the parts are first loaded on locating plates and these are fed into the machine from the lefthand side. Note that this set-up incorporates two checking fixtures also. At station 8 the depth of the countersink and the alinement of the holes reamed in the front cylinder heads at station 6 are checked, and at station 14 a similar fixture is used to check the same holes on the rear cylinders.

At station 22 the last operation is performed on the front heads only and in a direction at 90 deg. to the travel of the other heads except for the angular head at station 1. Because of the position of this last head, the heads must be transferred out of the machine at right angles to the main line. Several idle stations are placed here merely to facilitate unloading. Head and barrel assemblies are then automatically transferred through a washing machine where all oil and chips are removed. The locating plates are removed and the final finishing operations are performed on other machines.

SIMPLIFIED MOLYBDENUM DETERMINATION

By GEORGE M. POOLE
Chief Chemist, Ingersoll Steel & Disc Division, New Castle, Ind.

—Molybdenum steels, particularly those of moly in the higher percentages, are assuming an increasing importance in the defense program. Herein is described a very accurate and simplified procedure for moly determinations in such alloy steels—it is a modification of the James method, using the Cenco-Sheard-Sanford Photelometer.

A NUMBER of colorimetric methods employing butyl acetate for the extraction of molybdenum are used in various steel companies' laboratories. The original procedure was based upon the absorption of quinquavalent molybdenum thiocyanate by butyl acetate.[1]

The original method has been revised somewhat by various laboratories to suit their particular needs. One improvement has been proposed by the Climax Molybdenum Co. It has found that the addition of nitric acid to decompose the sample as recommended by James is not desirable as traces of this acid tend to increase the depth of color in the extraction.

The James method, as applied to the Photelometer, also is limited to steels with only a narrow range of molybdenum content (0 to 0.70 per cent) and to those with a relatively low alloy content. The use of molybdenum in steels since 1932 has been increasing tremendously. With tungsten on the strategic list in the defense program, molybdenum is replacing it in the higher alloy high speed steel compositions.

After making approximately 300 experimental determinations on five types of steel, it was found that a number of steps could be eliminated. The time for making a determination was shortened from 30 to 15 min. on the simple molybdenum steels. It was also found that steels with molybdenum content above 1 per cent could be accurately analyzed in only a few minutes' additional time.

Whereas the original method does not take into account the presence of large quantities of tungsten and chromium in the sample the suggested revision eliminates these as a factor in the final result.

According to the observations made in the Ingersoll Steel & Disc Division laboratory, the James method is not accurate when aliquot portions of the 0.1 gram sample are used for steels containing 2 to 6 per cent molybdenum. The resultant rapid fading is due, it is believed, to the upsetting of the balance between the iron content and the stannous chloride addition. When an aliquot portion is taken the iron in solution is proportionately lessened and two alternatives are necessary: either the specified amount of stannous chloride to be added must be lessened, or else an equivalent amount of iron must be added to the aliquot portion.

The revised method simplified for steels with 0.01 to 0.60 per cent molybdenum follows:

Procedure

Step No. 1
Use 0.1 gm. sample.

Step No. 2
Dissolve with 20 c.c. of 70 per cent perchloric acid, plus 10 c.c. water in 150 c.c. beaker with cover glass. (A few drops of hydrofluoric acid may be used to expedite solution.)

Step No. 3
Dissolve and heat for 1 to 2 min. after dense fumes forms.

(CONTINUED ON PAGE 164)

[1] L. H. James, *Industrial and Engineering Chemistry*, Anal. Ed., Vol. 4, 1932, p. 89.

CONSERVING ALUMINUM IN DIE CASTING

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UNDER the sponsorship of the American Society for Testing Materials' Committee B-6 on die-cast metals and alloys, a series of investigations has been under way looking toward a possible reduction in the aluminum content, from about 4 to 1.5 or 2.0 per cent, in the widely used alloys XXIII and XXV in the A.S.T.M. Specifications for zinc-base alloy die castings, B 86-38 T. This committee felt that some positive tests should be made before recommending any definite steps in the conservation of aluminum by this means, since some questions were raised concerning possible manufacturing difficulties which may be encountered relating to hot-shortness, shrinkage, freezing range and casting characteristics of the lower aluminum alloys.

Committee Report

A subcommittee of Committee B-6 prepared the following report of developments in their work on zinc base die casting alloys: The two zinc alloys most commonly used in the die casting trade today are A.S.T.M. alloys XXIII and XXV covered in Specifications B 86-38 T. The former is a zinc base alloy containing 4 per cent aluminum and 0.03 per cent magnesium. The latter differs by the inclusion of 1 per cent copper. Both alloys are compounded with special high grade zinc, 99.99 per cent pure, to A.S.T.M. Specifications B 6-37.

The eutectic in the zinc-aluminum system occurs at about 5 per cent aluminum. Alloys of 4 per cent aluminum are therefore close to the eutectic composition and have a short freezing range. Consequently they possess a minimum of casting difficulties, and the adoption of this aluminum content in the development of these alloys was based largely on the good casting properties coupled with what appeared to be the optimum combination of physical properties.

These standard alloys have been satisfactorily used for more than 10 years. Now, because of aluminum shortages, the possibility of using alloys with less than 4 per cent aluminum is being investigated. Preliminary results based on laboratory tests to effect this reduction are now available, with some conflicting commercial experience reported in the use of such low-aluminum alloys. At the suggestion of the OPM, this information, *the incomplete character of which cannot be too strongly emphasized*, has been reviewed and is presented here, briefly, for the information of producers and consumers of zinc die castings. There is no assurance at present that properties on which tests are not yet available may not interfere with the use of these alloys in some instances, at least, just as difficulties with casting properties have already come to light as commercial trials have followed the laboratory tests.

With respect to laboratory tests, Apex Smelting Co., Chicago, reported a considerable amount of data from which is taken the following comparison of these two alloys:

	Aluminum Per Cent	Copper Per Cent	Magnesium Per Cent
A.S.T.M. alloy XXV	4.1	1.0	0.03
Low aluminum substitute	1.5	1.0	0.03

	Alloy XXV	Substitute Alloy
Tensile strength, as cast, lb. per sq. in.	44,300	40,400
Tensile strength, 10 days, 203 deg. F. water vapor, lb. per sq. in.	34,500	28,000
Elongation, as cast, per cent	5.3	5.7
Elongation, 10 days, 203 deg. F. water vapor, per cent	3.7	5.7
Charpy impact (average gate and vent) as cast, ft.-lb.	38.5	34.0
Charpy impact (average gate and vent) 10 days, 203 deg. F. water vapor, ft.-lb.	6.7	12.8
Dimensional change on 6-in. bar, 10 days, 203 deg. F. water vapor, in.	—0.0002	—0.0006

The New Jersey Zinc Co. report that as far as their tests have gone, they have obtained substantial checks on the above results except

(CONCLUDED ON PAGE 161)

MAGNETIC TESTING

—With so much precision work now being tested magnetically, any basic research to improve this process is of great importance. The detailed report herein covers an investigation of the characteristics of five magnetic powders and studies the effectiveness of the magnetic test method.

By J. SEIFERT

Barberton Works Research Laboratory, Babcock & Wilcox Co.

THIS investigation was designed to explore the effectiveness of the magnetic testing method. Two viewpoints have been considered, namely, the nature of the powder, and the relationship of the width and depth of the crack below the surface upon the test. Only the dry method of testing has been used.

In brief, the dry method consists of dusting a dry powder of high magnetic permeability upon a previously magnetized area. The field in this test was obtained from the passage of current through the area to be tested and was used because of its ease of application and its correspondence to practical conditions. The five powders investigated represent those which were considered to be most effective. Their characteristics and suitability for magnetic testing were compared. As a measure of these values, three qualities were considered, namely:

(A) Distinctness:

Distinctness is the ease with which a powder may be detected on the surface of the material being tested. Note: In this series of tests smooth ground surfaces were used.

(B) Adherence:

Adherence is the property which a powder has, depending upon its magnetic permeability, to accumulate in a well-defined area above any crack.

(C) Depth Effect:

Depth effect is the property a powder may have (due to its shape, size and permeability of the particles) to outline clearly a defect which is furthest below the surface of the material being tested.

The five types of magnetic powders studied were as follows:

Type	Product Name	Manufacturer
(1)	Gray Magnaflux	Magnaflux Corp., Chicago, Ill.
(2)	E&E Magnaflux Crack Detector	E&E Co., Ltd., Strand, England.
(3)	Magnetite (250 mesh)	Commercial
(4)	Plastic Iron Powder (100 mesh)	National Radiator Co., Johnstown, Pa.
(5)	Smooth-On cement	Commercial

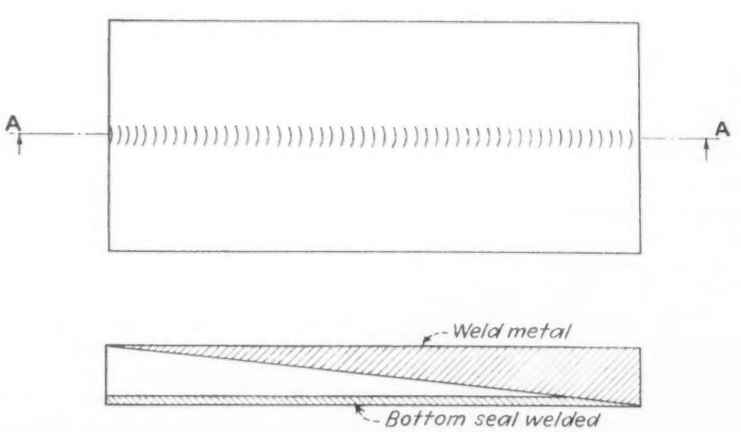


FIG. 1—Test plate prepared with a tapered weld groove to study the adherence and distinctness characteristics of the magnetic powders. At top is the top view of the test plate, and below is a section through A-A.

In order to determine the adherence and distinctness characteristics of a magnetic powder, a single-crack plate was so designed that separation of the crack faces was constant, and the depth of weld deposit unknown, except that it increased with the length of crack.

Design of Plate: A 14x1½-in. test plate was prepared with a tapered weld groove starting at the top surface of the plate at one end and increasing in depth to the thickness of the plate at the other, so that on welding this test plate complete weld penetration was obtained only at one end of the weld seam (see Fig. 1). In order to hold the partially incompletely welded plate sections together, a seal weld was deposited on the underside of the weld groove. The excess weld metal was subsequently machined from the plate surface, leaving a smooth surface plate with an under-surface face crack of unknown depth.

Comparison of Powders

Since the adherence of a magnaflux powder depends upon its magnetic permeability as well as the intensity of the leakage field about the defect, powder adherence should decrease with increasing distance from the surface at which a defect is located, the length of weld surface covered by the powder representing a quantitative measure for this value.

On this basis, this test plate was examined using the five magnetic powders already described and current values ranging from 50 to 400 amp.

For comparison of their effectiveness, the results obtained are presented in Table I. It will be observed that powders (1), (2) and (4) give better results as to distinctness and adherence than powders (3) and (5).

The photographs shown in Figs. 2 to 12 are typical comparisons of the effectiveness of the five powders under varied conditions, and Table II explains what variations of procedure were made for each photograph taken and lists the results obtained.

Further tests were designed to determine the effect of the separation of the crack faces and the depth of the crack below the surface upon the test method.

Design of Plate: A test plate was, therefore, constructed to give a series of sub-surface cracks of known depth and width. The photograph in Fig. 13 shows the top-side of the assembled test plate before welding. There are eight bars 1x2x10 in., each bar having a weld groove starting at zero depth on line A-A and a depth of known value at line B-B. Holes were drilled at the ends of each bar and bolts C and D were inserted, so that uniform tension could be obtained on the assembly. Shims of varying thicknesses were placed between the bars, then the bolts were drawn tight to hold the shims in place until after welding.

A light seal bead was deposited on the bottom-side of the plate along each crack; this was to insure that the bottom crack did not open up when subsequent beads of weld metal were deposited on the top weld grooves. After completion of the welding, the two ends were removed along lines A-A and B-B; these are shown in the photograph in Fig. 14. The depth and width relationship obtained by such an assembly can be seen more clearly by these photographs.

The top of the test plate was then machined and buffed to a smooth finish. The final depth of the cracks was now determined and is listed below with their respective widths.

Test Procedure: The finished test piece was 8⅛ in. long. By placing the electrodes at the end of each crack and applying current, ideal conditions were set up for conducting such a test; that is, the lines of force were then crossing the crack at right-angles and forming a leakage field of maximum intensity. Each crack was then tested in turn, using each type of magnetic powder and one of a series of current values from 50 to 1000 amp.

Photographs of the results of each individual test were made, and are shown in Figs. 15 to 19 inclusive. They are so listed that a comparison

Bar	Width	Depth Below Surface
1 to 2	Face crank (no shim)	From 0 in. to 0.188 in. (3/16 in.)
2 to 3	0.005 in. shim	From 0 in. to 0.172 in. (11/64 in.)
3 to 4	0.010 in. shim	From 0 in. to 0.219 in. (7/32 in.)
4 to 5	0.020 in. shim	From 0 in. to 0.313 in. (5/16 in.)
5 to 6	0.040 in. shim	From 0 in. to 0.422 in. (27/64 in.)
6 to 7	0.080 in. shim	From 0 in. to 0.453 in. (29/64 in.)
7 to 8	0.160 in. shim	From 0 in. to 0.734 in. (47/64 in.)

TABLE I—Effectiveness of Five Magnetic Powders

Type	Amperes	Adherence, In.	Distinctness	Electrode Distance, In.
(1)	50*	1⅝	G	3½
(2)	50*	1⅝	G	3½
(3)	50*	½	P	3½
(4)	50*	1⅝	G	3½
(5)	50*	1	F	3½
(1)	125	1⅞	F	3½
(2)	125	1¾	G	3½
(3)	125	1	P	3½
(4)	125	1¾	G	3½
(5)	125	1⅛	F	3½
(1)	150	1⅞	F	3½
(2)	150	2	G	3½
(3)	150	1½	P	3½
(4)	150	2⅛	G	3½
(5)	150	1½	F	3½
(1)	175	2	G	3½
(2)	175	2⅛	G	3½
(3)	175	1½	P	3½
(4)	175	2½	G	3½
(5)	175	1¾	F	3½
(1)	200	2½	F	3½
(2)	200	2⅛	G	3½
(3)	200	1⅜	P	3½
(4)	200	2½	G	3½
(5)	200	1¾	F	3½
(1)	250	2¼	G	3½
(2)	250	2	F	3½
(3)	250	2¼	P	3½
(4)	250	2⅝	G	3½
(5)	250	2⅛	G	3½
(1)	300	2½	G	3½
(2)	300	2¼	G	3½
(3)	300	2	P	3½
(4)	300	2½	F	3½
(5)	300	2½	F	3½
(1)	400	2¼	G	3½
(2)	400	2⅜	G	3½
(3)	400	2⅜	P	3½
(4)	400	2½	G	3½
(5)	400	2¼	F	3½
(1)	50*	1⅜	F	22½
(2)	50*	1¼	G	22½
(3)	50*	⅝	P	22½
(4)	50*	1	F	22½
(5)	50*	¾	F	22½
(1)	125	1	G	22½
(2)	125	1⅛	F	22½
(3)	125	¾	P	22½
(4)	125	1⅜	G	22½
(5)	125	1	F	22½
(1)	150	1½	G	22½
(2)	150	1⅜	G	22½
(3)	150	¾	P	22½
(4)	150	1½	G	22½
(5)	150	1⅛	P	22½
(1)	175	1⅜	F	22½
(2)	175	1⅜	F	22½
(3)	175	⅝	P	22½
(4)	175	1¼	G	22½
(5)	175	1	P	22½
(1)	200	1⅝	F	22½
(2)	200	1⅝	G	22½
(3)	200	⅝	P	22½
(4)	200	1½	G	22½
(5)	200	1¼	P	22½
(1)	250	1⅞	G	22½
(2)	250	2	G	22½
(3)	250	1½	P	22½
(4)	250	2¼	G	22½
(5)	250	1¼	F	22½
(1)	300	2¼	G	22½
(2)	300	2¼	G	22½
(3)	300	⅞	P	22½
(4)	300	2¼	G	22½
(5)	300	1⅜	F	22½
(1)	400	2½	G	22½
(2)	400	2⅜	G	22½
(3)	400	1⅛	F	22½
(4)	400	2½	G	22½
(5)	400	1½	F	22½

*Minimum.

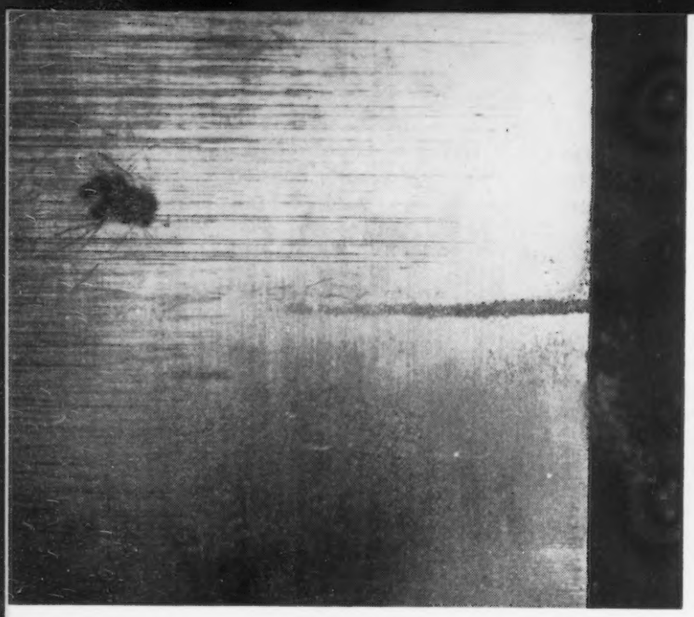


Fig. 2

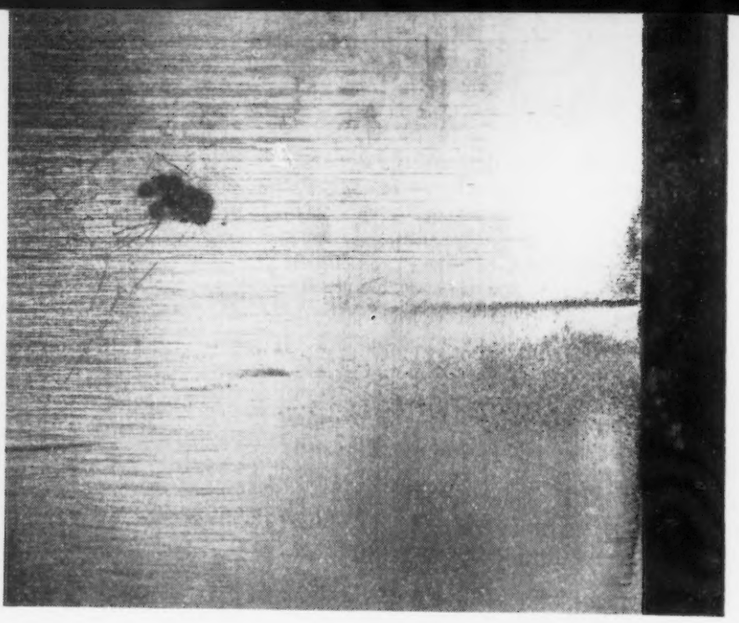


Fig. 3

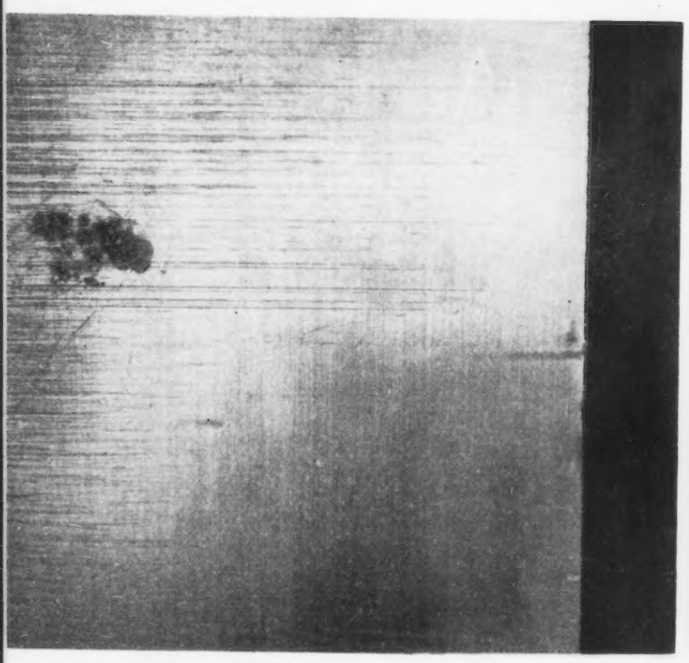


Fig. 6

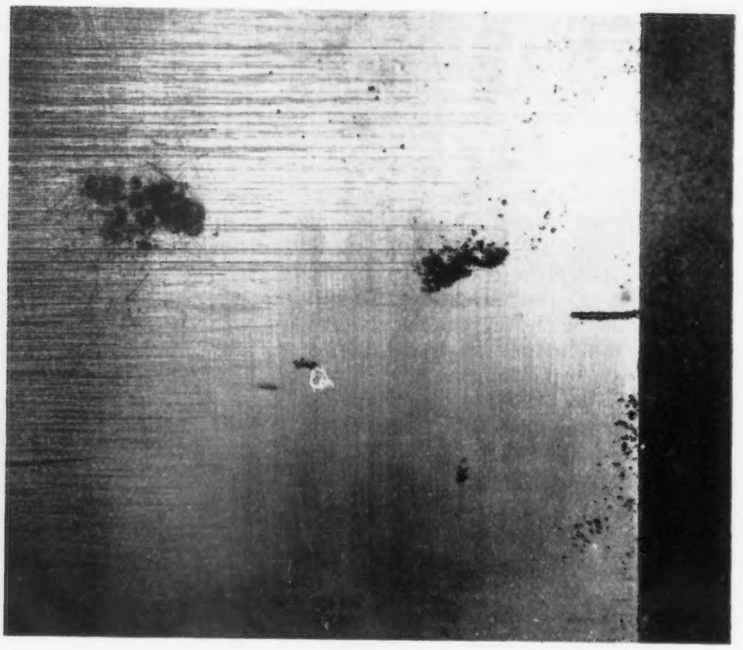


Fig. 7

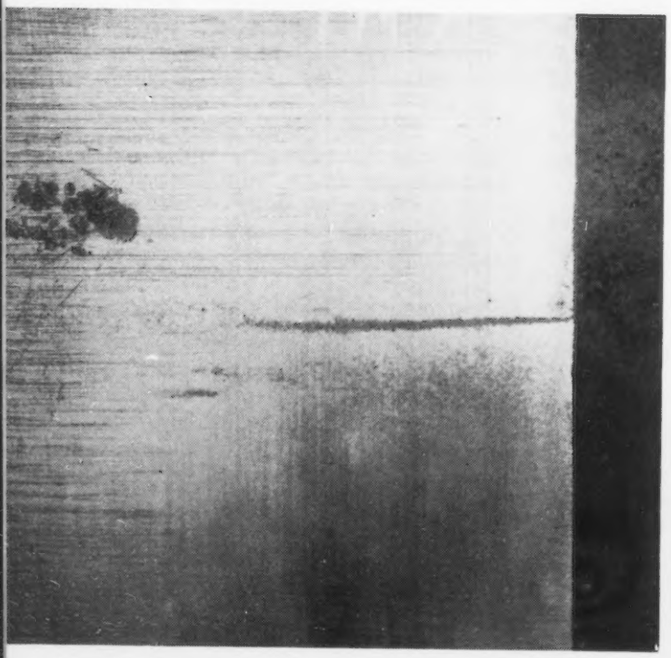


Fig. 9

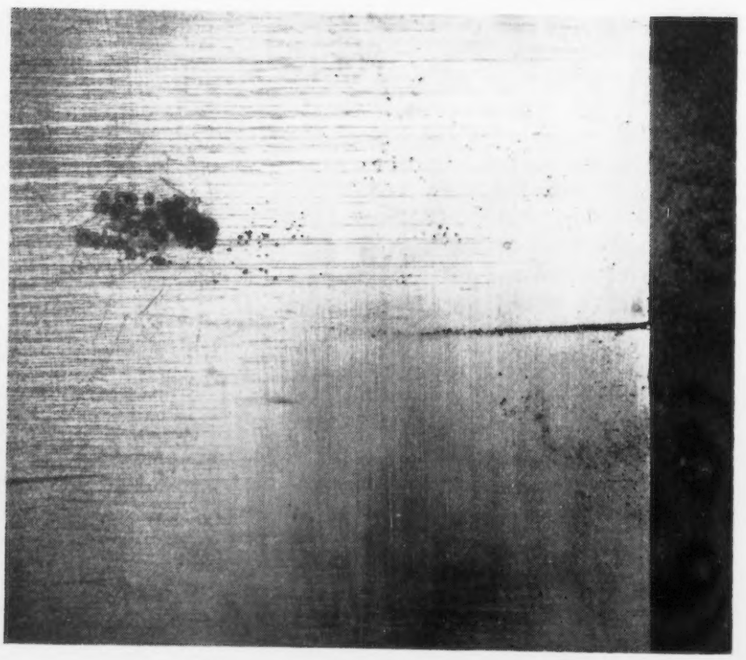


Fig. 10

Fig. 4

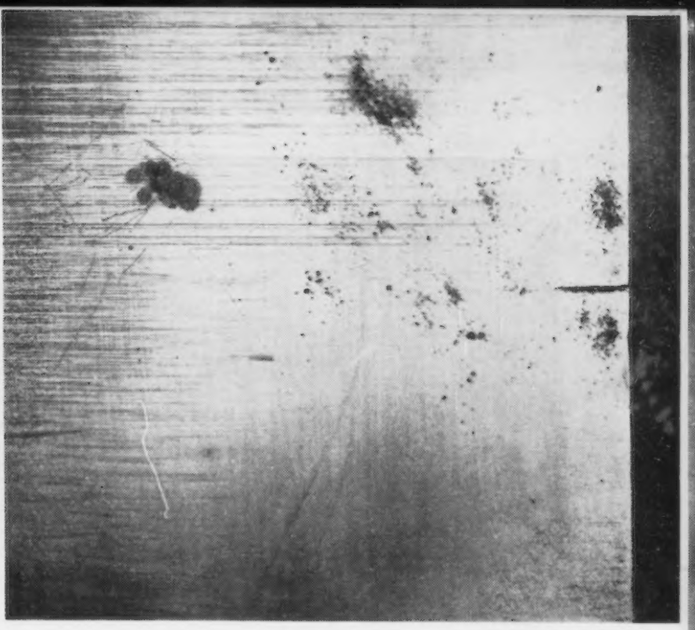


Fig. 5

Comparison of the Effectiveness of the Five Powders

(See Table II for Further Details)

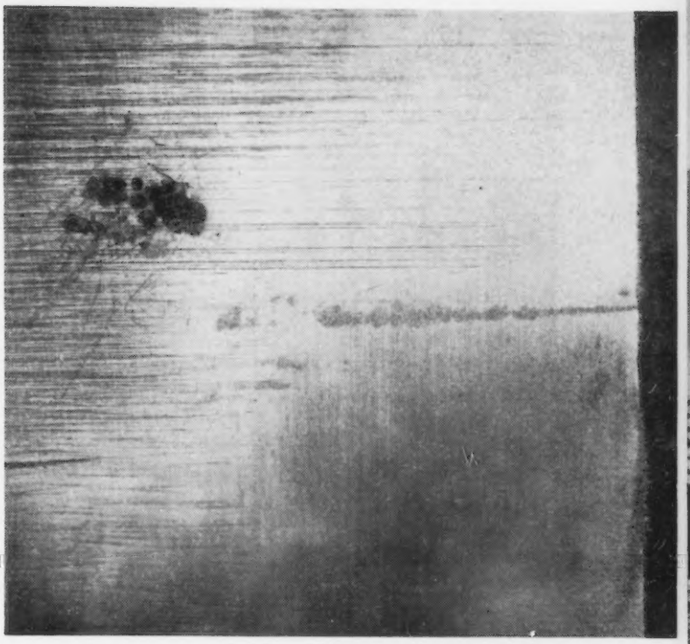


Fig. 8

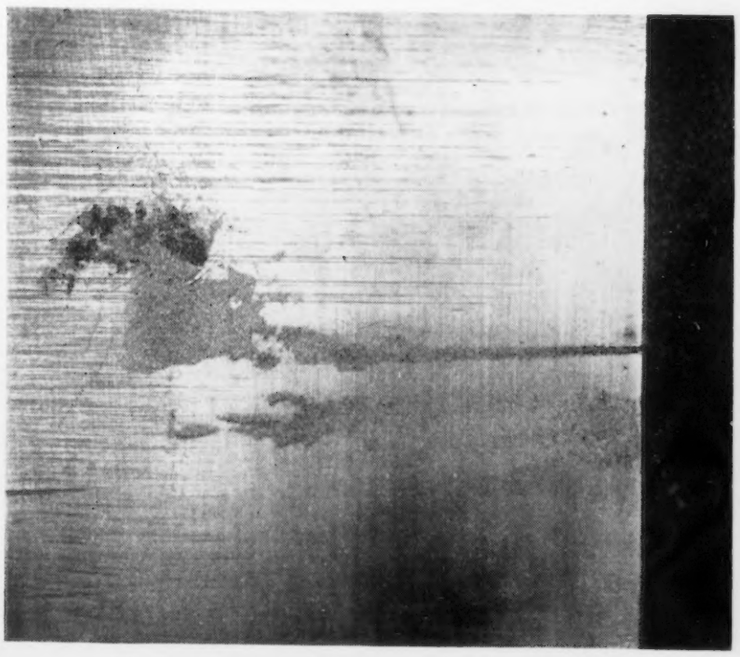


Fig. 11

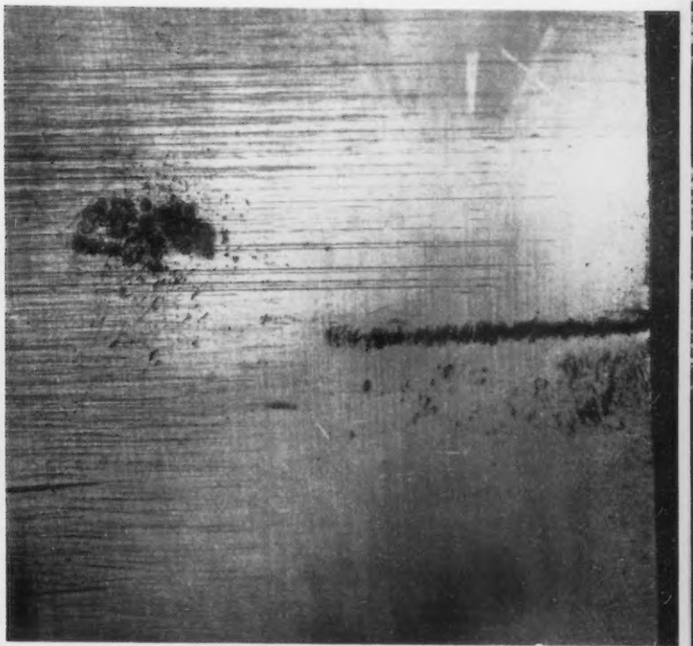
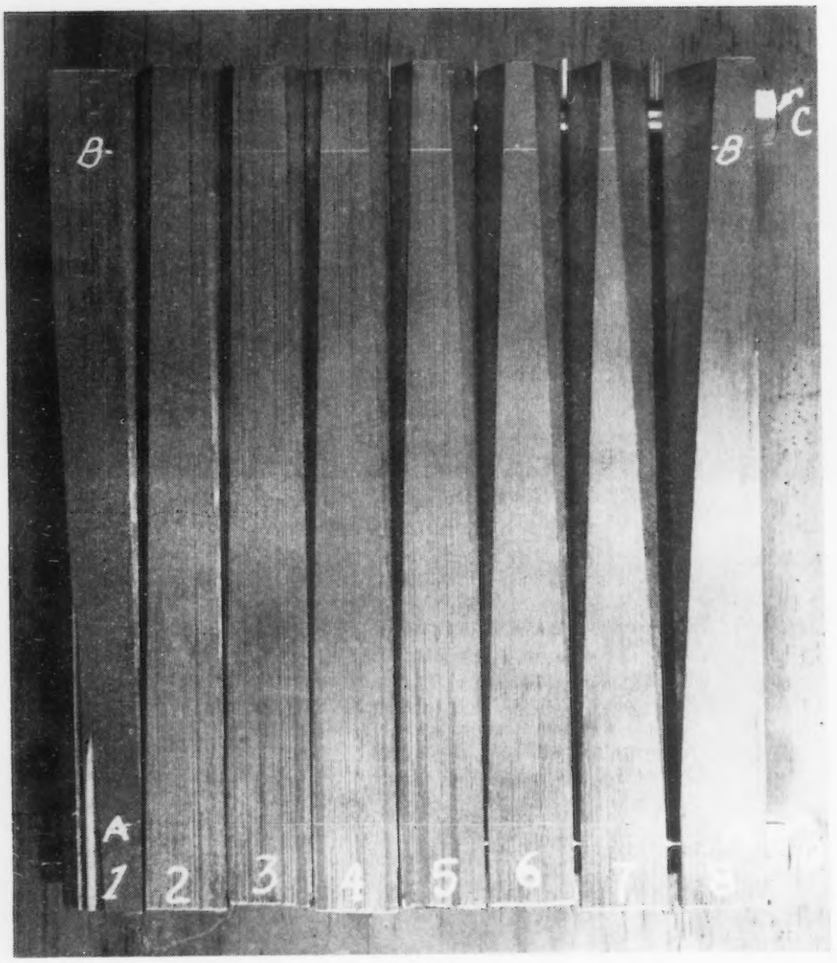


Fig. 12



could be made of one type of powder against another on all seven sub-surface cracks for current values from 50 to 400 amp. No photographs were made of results of current values above 400 amp., as this work was conducted at a later date. Since the trend of the powder characteristics improved with increasing current values, it was necessary to continue the investigation in order to determine the effectiveness of the powders at current values up to 1000 amp.

The length of the weld surface covered by the powder is taken as a measure of the crack depth below the surface to which the test is effective. Since the angle of the slope of each crack in the plate was known and the length of powder adhering to the plate measured, values were computed for the effective depth of each powder.

The adherence and depth effects for each magnetic powder over the complete series of current values are listed in Tables III and IV respectively. In this connection it may be mentioned that powders (1), (2) and (4) show maximum

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FIG. 13—The top side of the second test plate after being assembled and ready for welding.

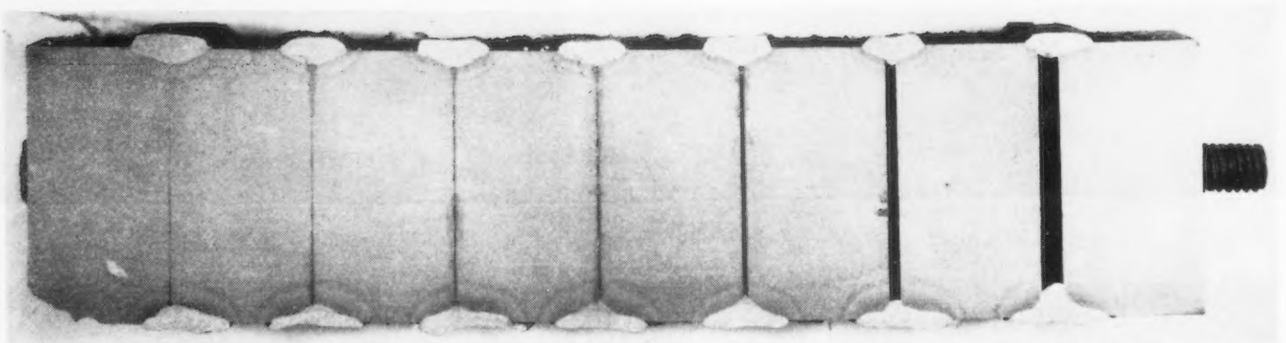
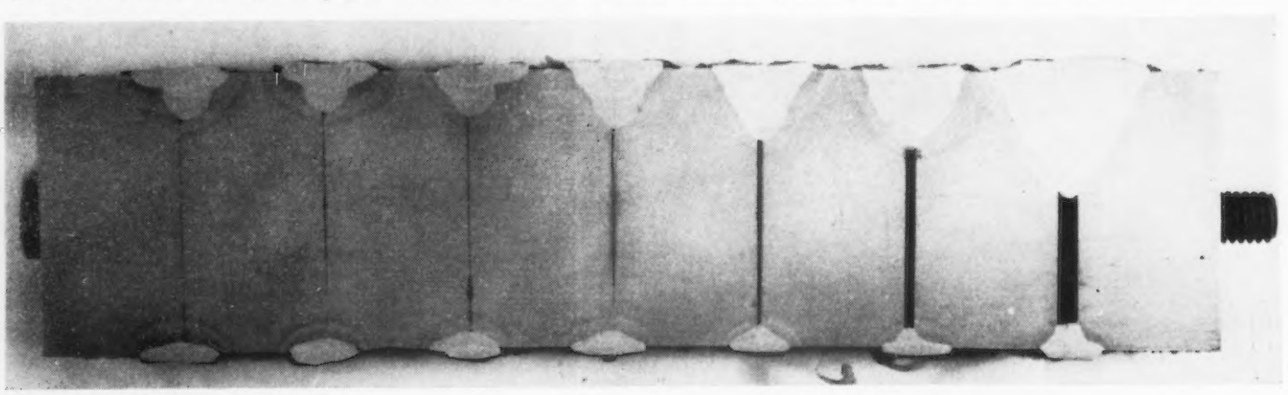


FIG. 14—(Above) Top of cross-section at B-B in Fig. 13; (below) top of cross-section at A-A in Fig. 13. Seal welds are at the bottom of the plate. These sections show the relationship of depth and width of crack in the test plate.



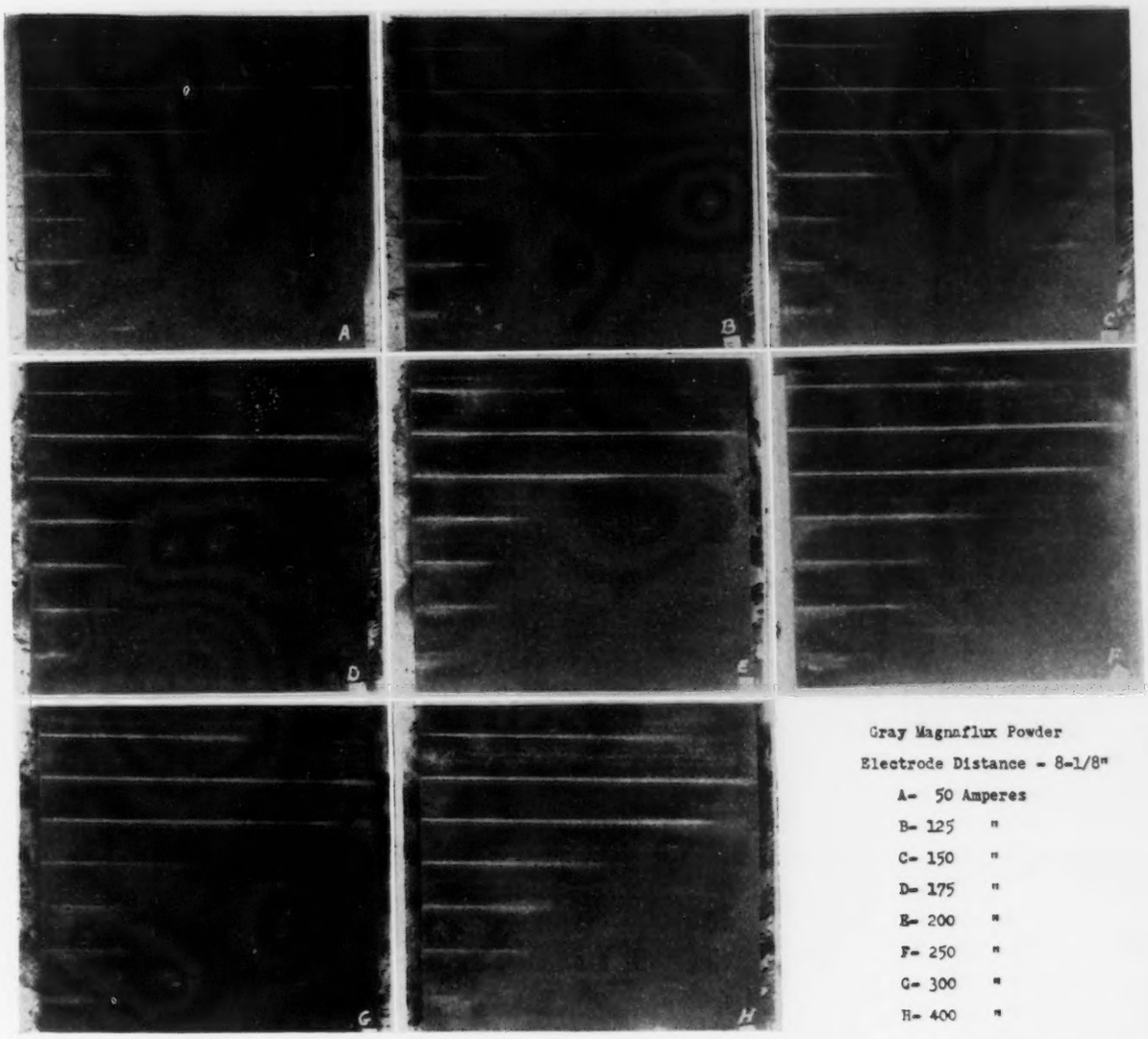


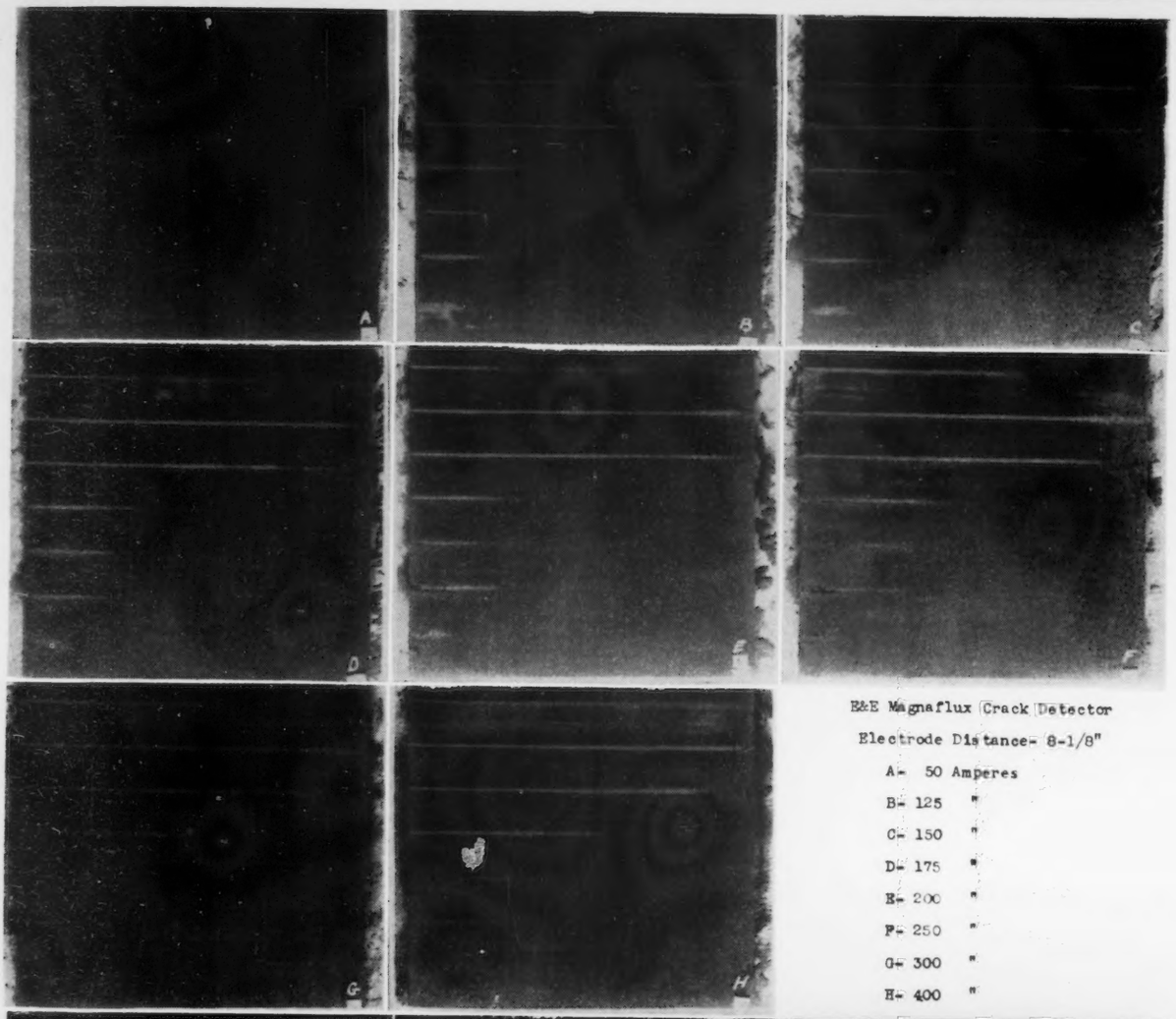
FIG. 15

PHOTOGRAPHS of results of each magnetic powder on all seven sub-surface cracks for current values from 50 to 400 amp. Gray Magnaflux powder shown in Fig. 15 (above) and other four powders in Figs. 16 to 19 (next page).

TABLE II

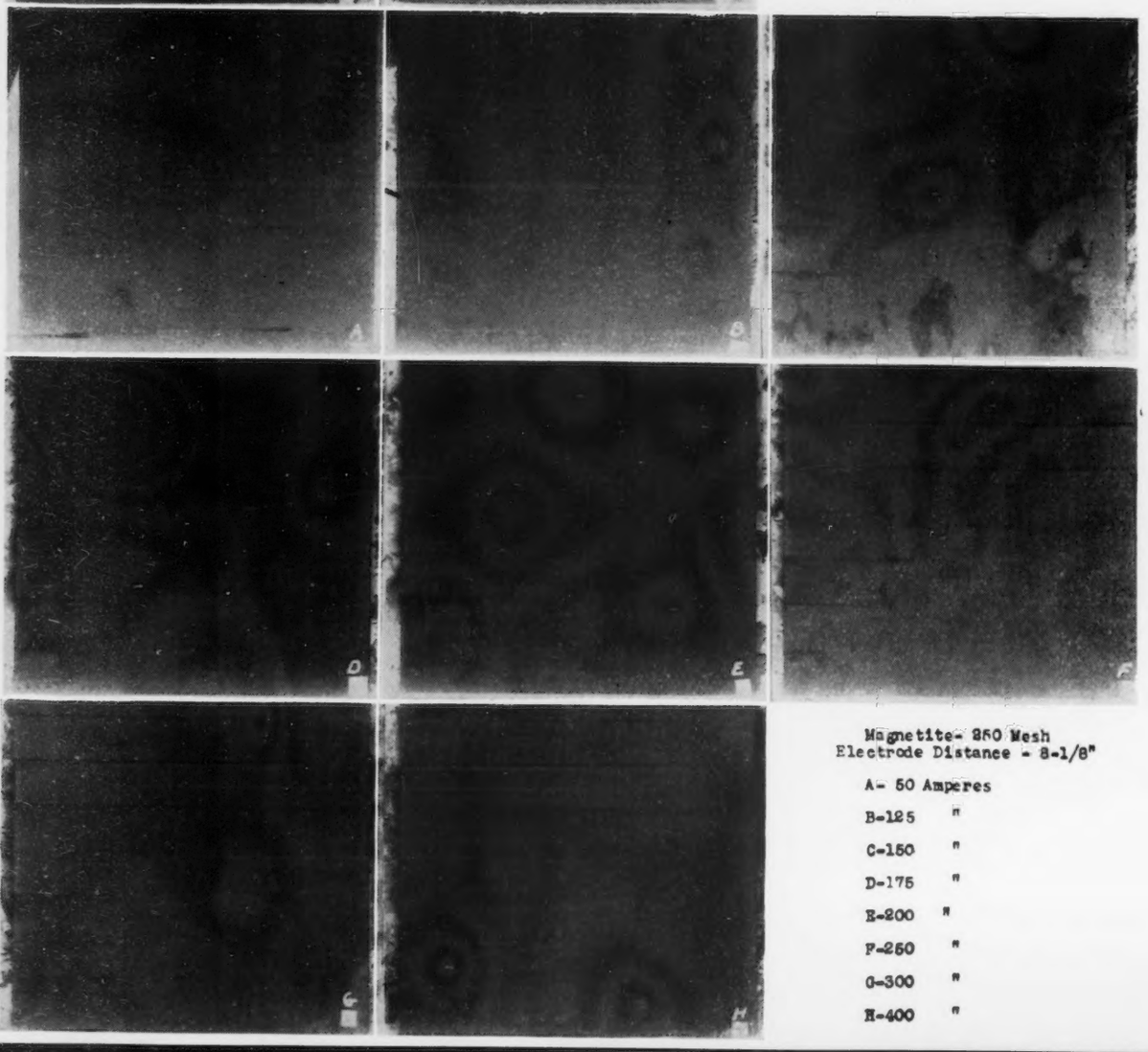
List of the Results and Variations in Procedure for Photographs Shown in Figs. 2 to 12

Photograph	Amperage	Electrode Distance, In.	Powder	Adherence, In.	Remarks
Fig. 2	300	22½	1	2¼	Maximum adherence for this powder.
Fig. 3	300	22½	4	2¼	Maximum adherence for this powder.
Fig. 4	50	22½	1	1⅜	Minimum adherence for this powder.
Fig. 5	50	22½	3	⅝	Minimum adherence for this powder.
Fig. 6	50	3½	1	1⅝	Minimum adherence.
Fig. 7	50	3½	3	½	Minimum adherence.
Fig. 8	300	3½	1	2½	These five photographs show maximum adherence for all five powders, using same electrode distances and same current value.
Fig. 9	300	3½	2	2¼	
Fig. 10	300	3½	3	2	
Fig. 11	300	3½	4	2½	
Fig. 12	300	3½	5	2⅛	



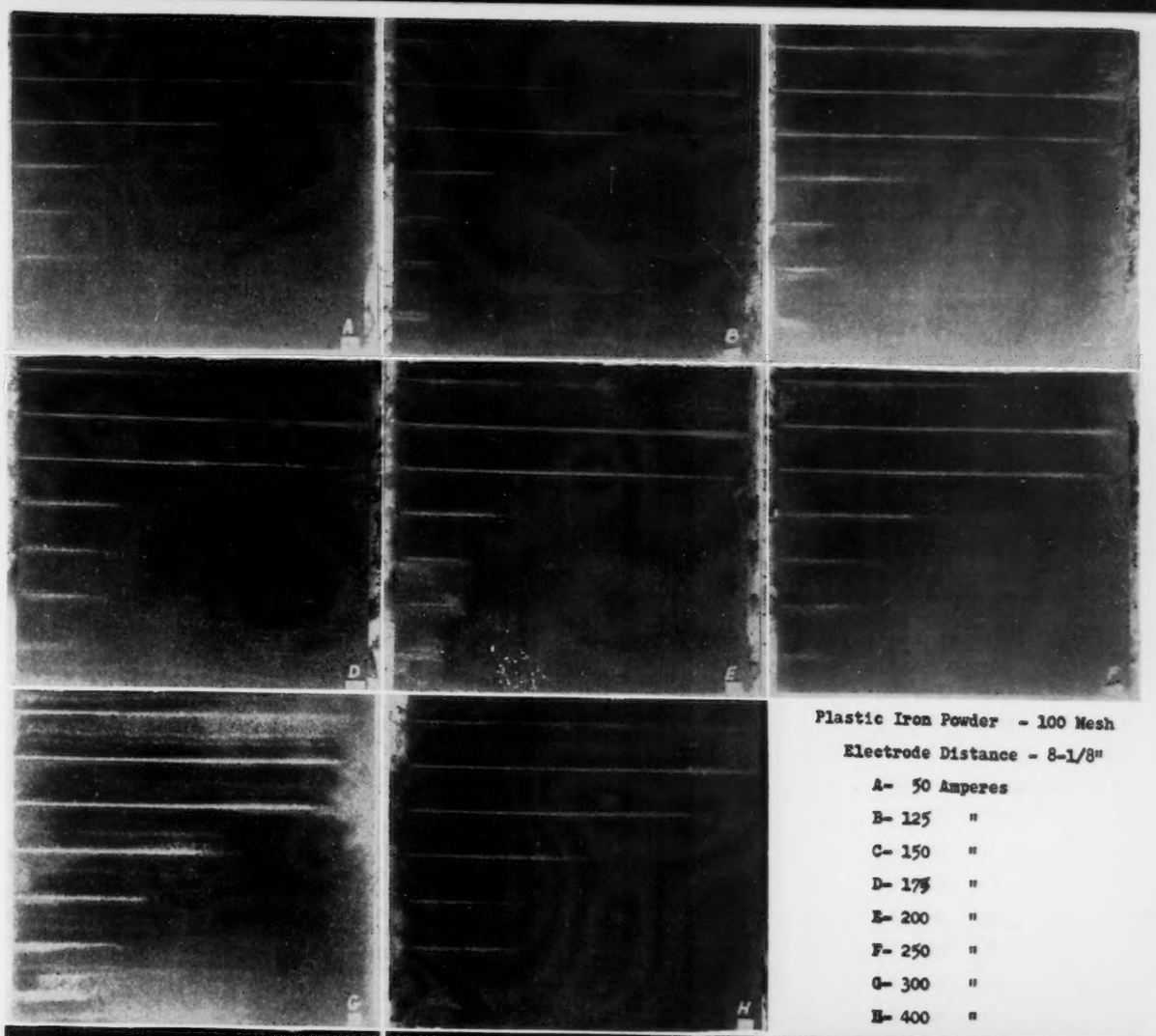
B&E Magnaflux Crack Detector
Electrode Distance- 8-1/8"
A- 50 Amperes
B- 125 "
C- 150 "
D- 175 "
E- 200 "
F- 250 "
G- 300 "
H- 400 "

FIG. 16 — Results of B&E Magnaflux Crack Detector on all seven sub-surface cracks for current values from 50 to 400 amp.



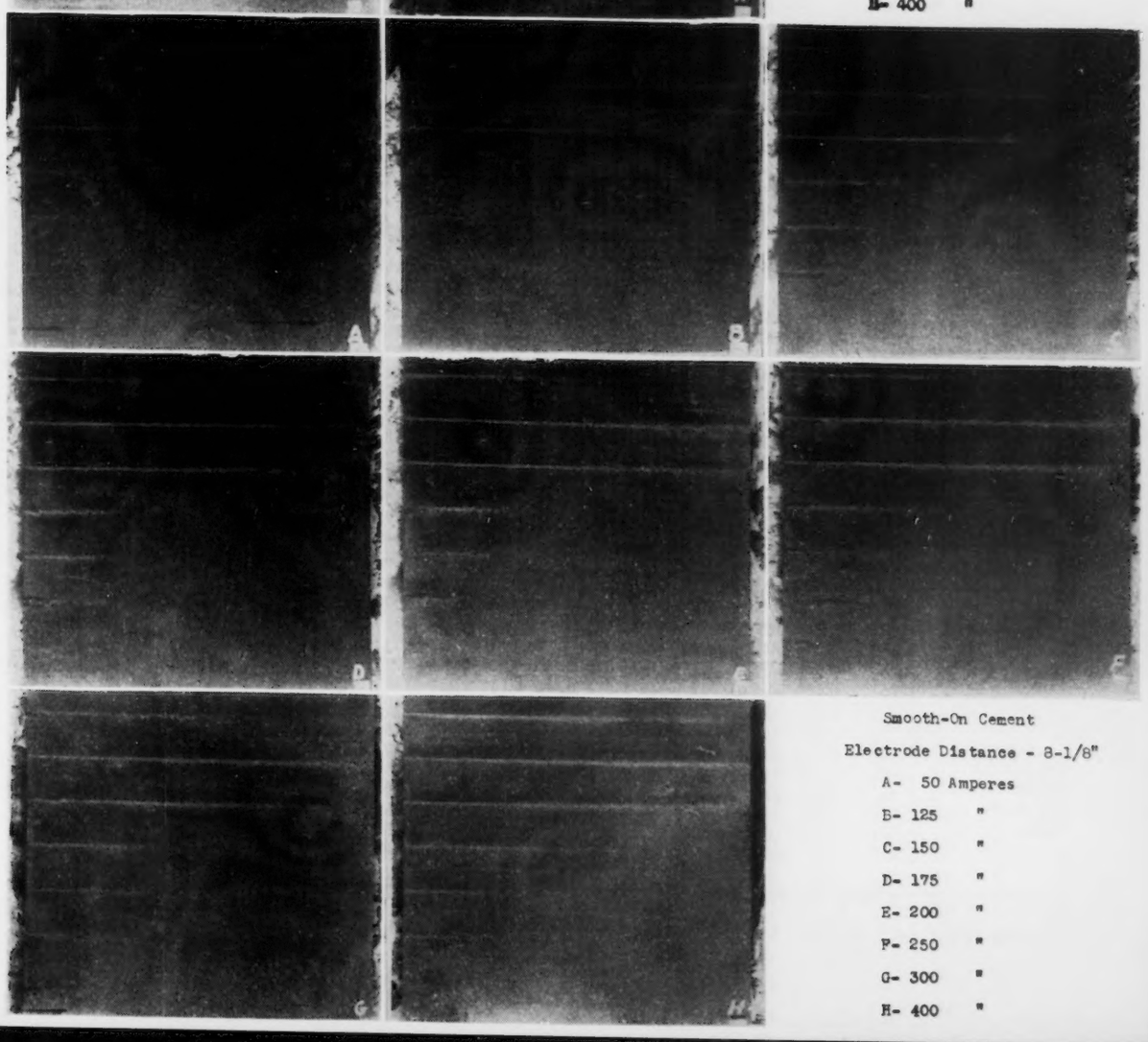
Magnetite- 250 Mesh
Electrode Distance - 8-1/8"
A- 50 Amperes
B-125 "
C-150 "
D-175 "
E-200 "
F-250 "
G-300 "
H-400 "

FIG. 17 — Results of Magnetite on all seven sub-surface cracks for current values from 50 to 400 amp.



Plastic Iron Powder - 100 Mesh
Electrode Distance - 8-1/8"
A- 50 Amperes
B- 125 "
C- 150 "
D- 175 "
E- 200 "
F- 250 "
G- 300 "
H- 400 "

FIG. 18 — Results of Plastic Iron Powder on all seven sub-surface cracks for current values from 50 to 400 amp.



Smooth-On Cement
Electrode Distance - 8-1/8"
A- 50 Amperes
B- 125 "
C- 150 "
D- 175 "
E- 200 "
F- 250 "
G- 300 "
H- 400 "

FIG.19—Results of Smooth-On Cement on all seven sub-surface cracks for current values from 50 to 400 amp.

TABLE III

The Adherence for Each Magnetic Powder Over the Complete Series of Current Values

	Crack	Current, Amperes: 50	125	150	175	200	250	300	400	550	700	1000
Gray Magnaflux Powder, adherence, inches	(1)	5.50	4.69	6.60	4.40	4.95	7.15	5.50	7.15	8.14	8.14	8.14
	(2)	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(3)	5.30	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(4)	2.49	2.20	3.04	3.08	2.88	4.95	3.59	4.69	8.14	8.14	8.14
	(5)	1.39	1.94	1.94	2.33	2.20	2.30	2.88	3.30	4.63	5.00	4.50
	(6)	1.52	2.20	1.45	2.20	2.20	2.75	2.40	2.62	3.13	3.50	3.50
	(7)	0.79	1.10	1.39	1.10	0.97	1.39	1.52	1.52	1.75	2.00	1.75
E&E Magnaflux Crack Detector, adherence, inches	(1)	4.95	5.50	5.50	6.05	5.50	5.24	4.69	8.14	8.14	8.14	8.14
	(2)	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(3)	5.79	6.60	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(4)	2.44	3.04	3.59	2.75	2.75	3.85	4.40	4.68	8.14	8.14	8.14
	(5)	1.54	1.51	2.20	2.20	2.33	2.75	2.75	2.88	4.25	5.13	4.38
	(6)	1.94	1.94	1.94	2.20	2.20	2.33	2.20	2.33	3.13	3.50	3.81
	(7)	1.10	1.10	1.10	1.10	1.03	1.10	1.39	1.10	1.75	2.00	2.00
Magnatite, adherence, inches	(1)	0.84	0.84	1.65	1.39	2.20	4.14	5.50	6.05	8.14	8.14	8.14
	(2)	2.95	3.30	4.95	6.05	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(3)	2.75	2.75	3.85	3.30	3.85	8.14	8.14	8.14	8.14	8.14	8.14
	(4)	1.23	1.39	1.39	1.94	2.07	2.33	3.04	3.04	5.20	7.45	6.05
	(5)	0.84	0.84	1.23	1.39	1.41	2.33	2.20	2.49	3.81	3.83	3.81
	(6)	0.84	0.86	1.23	1.39	2.07	2.20	2.20	2.33	3.00	3.43	3.25
	(7)	0.0	0.0	0.29	0.55	0.84	0.90	1.10	1.10	1.63	1.83	1.75
Plastic Iron, adherence, inches	(1)	4.53	5.50	6.05	4.95	4.95	5.01	5.50	5.79	8.14	8.14	8.14
	(2)	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(3)	5.50	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(4)	2.49	2.75	2.88	2.88	2.88	3.72	4.95	4.69	8.14	8.14	8.14
	(5)	1.23	1.39	1.39	2.07	1.78	2.49	3.10	2.75	4.81	4.94	5.00
	(6)	1.14	1.10	1.23	2.07	1.65	1.94	2.49	2.49	3.38	3.44	3.43
	(7)	0.42	0.84	0.62	1.39	1.10	1.39	1.94	1.23	2.00	2.00	1.89
Smooth-On Cement, adherence, inches	(1)	3.59	2.49	3.85	3.30	4.14	3.59	4.14	5.24	8.14	8.14	8.14
	(2)	7.76	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(3)	4.27	5.08	5.50	8.14	8.14	8.14	8.14	8.14	8.14	8.14	8.14
	(4)	1.65	1.94	2.75	2.20	1.94	2.49	2.75	3.59	4.94	7.25	6.00
	(5)	1.23	1.39	1.94	1.84	1.78	1.94	1.94	2.20	3.50	4.31	4.25
	(6)	1.10	1.39	1.10	1.65	1.23	1.94	1.94	2.20	2.75	3.23	3.19
	(7)	0.0	0.0	0.13	0.27	0.55	0.83	1.10	0.55	1.30	1.38	1.31

TABLE IV

The Depth Effect of Each Powder Over the Complete Series of Current Values

	Crack	Current, Amperes: 50	125	150	175	200	250	300	400	550	700	1000
Gray Magnaflux Powder, effective depth, inches	(1)	0.126	0.108	0.152	0.101	0.114	0.164	0.126	0.164	0.187	0.187	0.187
	(2)	0.111	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
	(3)	0.143	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219
	(4)	0.095	0.084	0.116	0.118	0.110	0.190	0.138	0.181	0.313	0.313	0.313
	(5)	0.072	0.101	0.101	0.121	0.114	0.172	0.150	0.172	0.240	0.260	0.234
	(6)	0.085	0.123	0.081	0.123	0.154	0.134	0.147	0.175	0.196	0.196	0.196
	(7)	0.071	0.099	0.125	0.099	0.087	0.125	0.137	0.137	0.158	0.180	0.158
E&E Magnaflux Crack Detector, effective depth, inches	(1)	0.114	0.126	0.126	0.139	0.126	0.120	0.108	0.187	0.187	0.187	0.187
	(2)	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
	(3)	0.156	0.178	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219
	(4)	0.095	0.117	0.138	0.105	0.105	0.148	0.169	0.179	0.313	0.313	0.313
	(5)	0.080	0.078	0.114	0.114	0.121	0.143	0.143	0.150	0.221	0.267	0.229
	(6)	0.109	0.109	0.109	0.123	0.123	0.130	0.123	0.130	0.175	0.196	0.213
	(7)	0.099	0.099	0.099	0.099	0.093	0.099	0.125	0.099	0.158	0.180	0.180
Magnatite, effective depth, inches	(1)	0.019	0.019	0.038	0.032	0.050	0.095	0.126	0.139	0.187	0.187	0.187
	(2)	0.062	0.069	0.104	0.127	0.171	0.171	0.171	0.171	0.171	0.171	0.171
	(3)	0.074	0.074	0.104	0.089	0.104	0.219	0.219	0.219	0.219	0.219	0.219
	(4)	0.047	0.053	0.053	0.074	0.080	0.089	0.116	0.116	0.199	0.286	0.232
	(5)	0.043	0.043	0.064	0.072	0.073	0.121	0.114	0.129	0.198	0.199	0.198
	(6)	0.047	0.048	0.069	0.078	0.116	0.123	0.123	0.130	0.168	0.192	0.182
	(7)	0.0	0.0	0.026	0.050	0.076	0.081	0.099	0.099	0.147	0.165	0.158
Plastic Iron, effective depth, inches	(1)	0.104	0.126	0.139	0.114	0.114	0.115	0.139	0.133	0.187	0.187	0.187
	(2)	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
	(3)	0.148	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219
	(4)	0.095	0.105	0.110	0.110	0.110	0.143	0.190	0.181	0.313	0.313	0.313
	(5)	0.064	0.072	0.072	0.108	0.092	0.129	0.161	0.143	0.250	0.257	0.260
	(6)	0.064	0.062	0.069	0.116	0.092	0.109	0.139	0.139	0.190	0.193	0.192
	(7)	0.038	0.076	0.066	0.125	0.099	0.125	0.175	0.110	0.180	0.180	0.170
Smooth-On Cement, effective depth, inches	(1)	0.082	0.057	0.088	0.076	0.095	0.082	0.076	0.124	0.187	0.187	0.187
	(2)	0.161	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171	0.171
	(3)	0.115	0.137	0.148	0.219	0.219	0.219	0.219	0.219	0.219	0.219	0.219
	(4)	0.063	0.074	0.105	0.084	0.074	0.095	0.105	0.138	0.190	0.279	0.230
	(5)	0.064	0.072	0.100	0.095	0.092	0.100	0.100	0.114	0.182	0.224	0.221
	(6)	0.062	0.078	0.062	0.092	0.069	0.109	0.109	0.123	0.154	0.181	0.179
	(7)	0.0	0.0	0.012	0.024	0.050	0.075	0.099	0.050	0.117	0.124	0.118

depth effect, revealing sub-surface cracks to a depth of 0.313 in. (5/16 in.)

Figs. 20 to 26 represent graphically the adherence and effective depth of all five powders against current values when subjected to individual sub-surface cracks. In this respect a comparison can be made of the effectiveness of one powder over another on each sub-surface crack.

Conclusion

Comparing the results of the graphs shown in Figs. 20 to 26 and Figs. 15 to 19, it may be seen that powders (1), (2) and (4) display the best characteristics. Powders (3) and (5) are particularly deficient in distinctness and also do not show the same adherence and depth effect as powders (1), (2) and (4). A comparison of the ratings of the three superior powders is shown at the bottom of the opposite page.

Referring to Figs. 20 to 26, it is interesting to note that as current values increase a maximum of effectiveness is obtained, and if higher values are used the effectiveness does not increase and may even diminish due to the leakage of the magnetic field through the air between the electrodes. This leakage tends to reduce the field in the plate and cause a banding of the powders between the electrodes, which is detrimental, as it has a tendency to obscure the powder patterns formed on the plate. Therefore, for the inspection of sub-surface cracks, and in general all weld inspection, values from 350 to 700 amp. should be used.

Larger Defect Difficult

With respect to the size of defect, results show that as the defect becomes larger it is harder to locate if its depth below the surface increases, for the reason that the lines of force follow the contour of the defect, reducing the leakage field above the crack. In this connection it is of importance to note that the depth to which a crack can be located below the surface of the metal depends on a number of variables, including the total area of the section, the extent, shape and relative position of the defect, the permeability of the material and a powder of the most favorable characteristics.

When defects in large objects lie more than ½ in. below the surface,

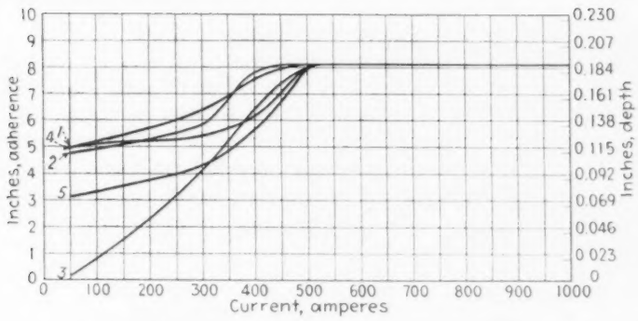


Fig. 20—Comparison of magnetic powders on face crack.

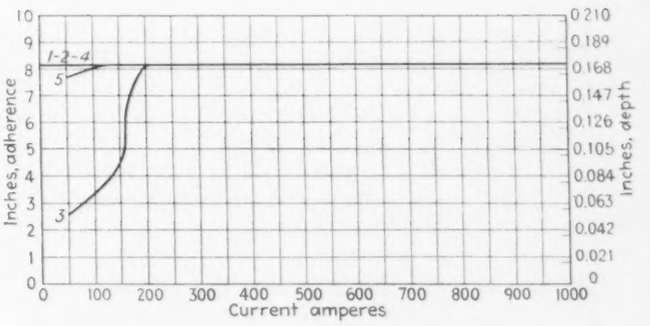


Fig. 21—Comparison of magnetic powders on 0.005-in. crack.

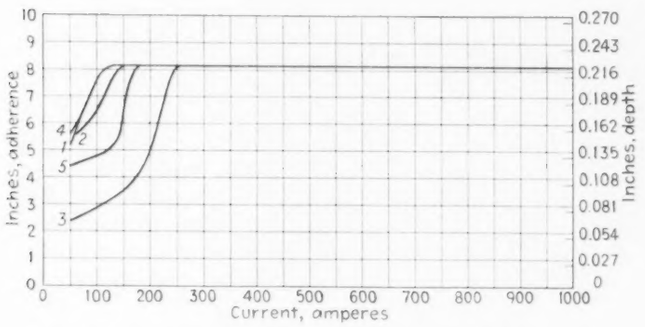


Fig. 22—Comparison of magnetic powders on 0.010-in. crack.

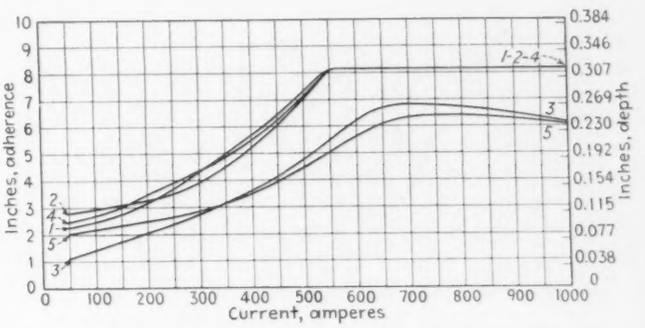


Fig. 23—Comparison of magnetic powders on 0.020-in. crack.

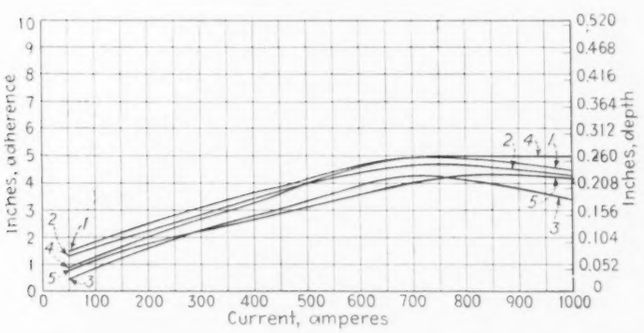


Fig. 24—Comparison of magnetic powders on 0.040-in. crack.

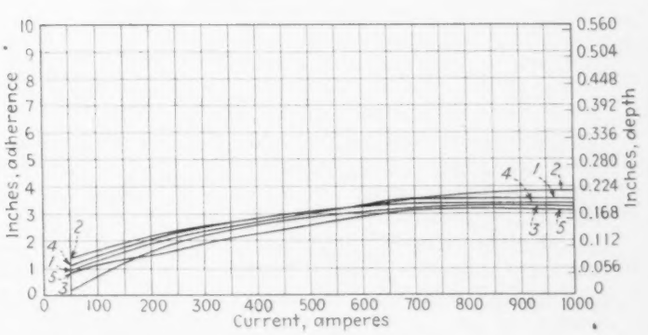


Fig. 25—Comparison of magnetic powders on 0.080-in. crack.

Adherence and Effective Depth of Powders vs. Current Values

1 = Gray Magnaflux; 2 = E&E Magnaflux Crack Detector; 3 = Magnetite; 4 = Plastic Iron; 5 = Smooth-On Cement. Maximum adherence obtained at 8.14 in. as this is the total length of test plate.

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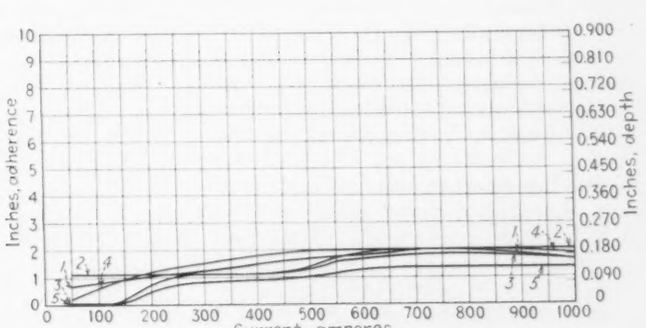


Fig. 26—Comparison of magnetic powders on 0.160-in. crack.

they are hard to distinguish due to the fact that the leakage field is widely diffused by the time it reaches the surface, causing a wide band of powder hard to interpret. But, in general, sub-surface defects of damaging size can be located in most instances when relatively near the surface.

Powder	Distinctness	Adherence	Depth Effect	Adherence, In.	Depth, In.
(1)	Fair	Best	Best	8⅛	5/16
(2)	Slightly better than (1) and (4)	Lower than (1) and higher than (4)	Lower than (1) and higher than (4)	8⅛	5/16
(3)	Higher than (1) and lower than (2)	Lower than those of (1) and (2)	Lower than those of (1) and (2)	8⅛	5/16

PLASTER MOLDS

A new method of producing non-ferrous castings — the Capaco plaster mold process— which holds considerable promise as a means of obtaining unusually close tolerances in the as-cast state, is described in detail for the first time in this article. Production technique, from raw material to finished casting, as practiced in the newest plant to be designed specifically to use plaster molds for production work, is covered in detail.

By W. A. PHAIR

Associate Editor, The Iron Age

DEVELOPMENT of a casting investment that would be absolutely moisture free, sufficiently porous to be self-venting, flexible enough to be able to take and accurately hold during pouring any castable form, and yet economical enough to permit competing with existing molding mediums, has long been the goal of much foundry research.

Several of these virtues may be found in many of the materials now in use, but none has all. Cement, perhaps, comes theoretically closest to having all, but as yet this material is not practical for making small production castings.

Research workers, while working with sands and cement, have constantly kept half an eye on plaster as a possible candidate for the role of the ideal molding material; half an eye largely to keep track of what the competition was doing rather than because of any sincere belief that plaster could be adapted to economical production molding use.

Plaster as a casting investment is actually centuries old. It has been used extensively in the fine arts for producing bronze statuary. In the 16th century, Benvenuto Cellini described the use of plaster for molding small castings and he also noted the use of plaster as a core for other metals. Over the past 30 years or so, plaster has had a limited commercial use in this country—the product made, however, being sometimes of tricky, mechanical design, and a great deal of the business being of an ornamental nature, one large automotive company using it for radiator caps. It never, however, has approached true production use, in today's sense.

The delay in adoption of plaster has been due chiefly to inability to develop a method of drying the material in a sufficiently short time to permit economical production. While this was the basic problem, it, of course, involved a dozen different technical questions, each of which would have to be attacked individually but all of which were connected directly with the drying problem.

Over the past five years, however, investigations of the possibilities of plaster as a mold body have been intensively pursued and it appears today that the solution of the chief problems is at hand and the method is on its way to acceptance as an economical method, from the overall cost viewpoint, within its scope, of producing castings.

On Taft Avenue in Cleveland, the Briggs Mfg. Co., well known automobile body manufacturer with home offices in Detroit, has put into operation a large new foundry, utilizing plaster molds exclusively. Briggs uses what is called the Capaco process and is licensed by Castings Patent Corp. of Chicago. In addition to the Briggs plant, which is the largest user of the Capaco process, three other foundries are also licensed and in operation using it. These are Atlantic Casting & Engineering Corp., Clifton, N. J., Universal Castings Corp., Chicago, and W. D. Allen Mfg. Co., Chicago.

The Briggs installation is not only the largest in the country but the Briggs company has also made substantial engineering improvements in respect to machinery used and general operation. The Briggs plant has a daily capacity of 20,000 lb. of non-ferrous metals.

Many individuals and companies have had their spoons in the gypsum plaster mold broth over the past two decades. Not considering the very early work, probably the most active devotee of the idea has been Henry Hagemeyer of Castings Patent Corp., Chicago, who is responsible for the bulk of the patents (see footnote) supporting the Capaco process. Almost from the beginning Hagemeyer associated himself with William Henry Murphy, prominent Chicago lawyer. To-

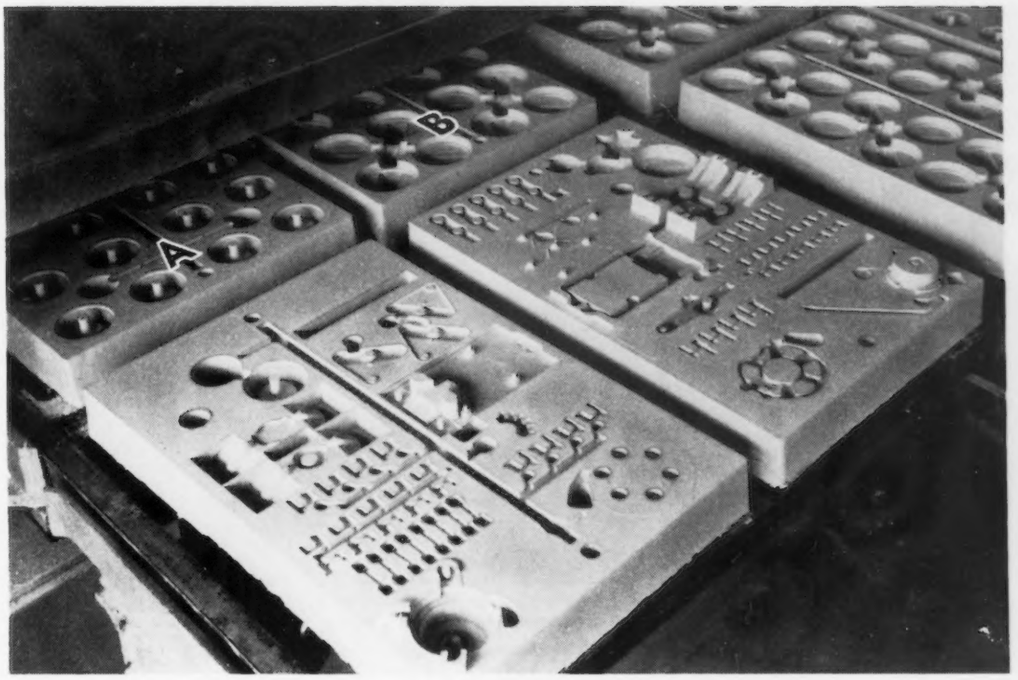
AT RIGHT

BAKED plaster molds emerging from the oven, showing arrangement of castings and gates. Section marked A is a cope, while section B is a matching drag. Faint lines can be seen on the mold marking the boundaries of the pattern units.

o o o

BELOW

NAME plate and decorative plaque in brass, cast in plaster molds.



gether they have worked out the various legal phases involved in developing commercial acceptance for the castings produced by this process.

The Briggs foundry at Cleveland (see illustration) has been designed and engineered from the bottom up to use the Capaco process. It is also the newest Capaco plant to be built and consequently embodies the latest refinements, both its own and Capaco's, in production of castings by this process. For these reasons, this report will be based primarily on the Briggs installation.

To a visiting fireman, the most notable features of the Capaco process are the unusual dimensional accuracy, faithful reproduction of fine details, attractive as-cast surface, and absence of sand piles. No one of these attributes can be properly ascribed to any one phase of the process. Rather, they represent in sum the various factors involved in the process.

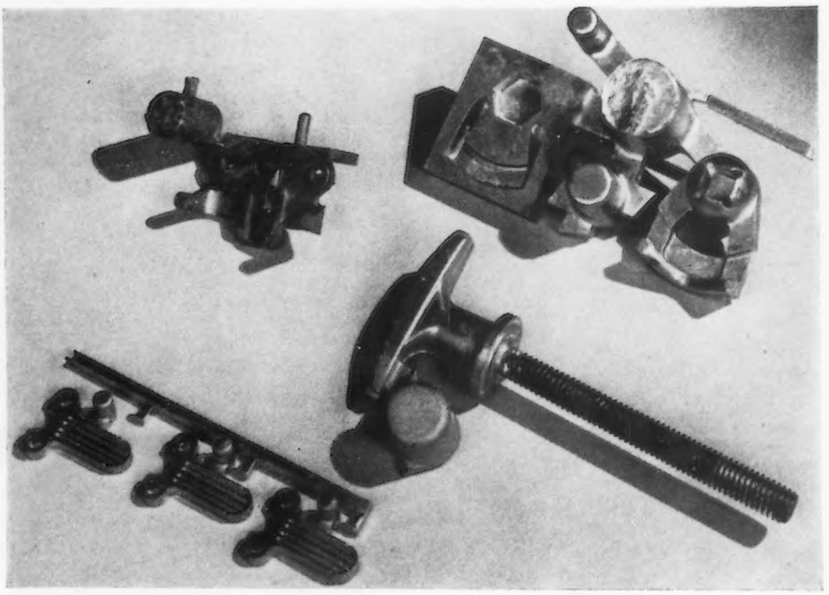
The development of the Capaco method has been accompanied by the growth of a new concept of molding and pouring practice. It has made necessary the development of mechanical equipment not heretofore associated with foundry work. These facts, emphasized by all men who have worked with the method, require delving into certain fundamentals of casting production to make possible a clear understanding of this new method.

Before discussing the details of the production of Capaco castings, an abridged outline of its components will simplify following the more technical phases. Briefly, then, the procedure is as follows: The plaster is mixed with other dry elements, to give it strength, and is then mixed with water. The pattern impression is established in the mix when it is semi-set. This is followed by a baking of the mold after the pattern has been withdrawn. Cores, also of plaster, are inserted after baking, then cope and drag joined, and the casting poured.

The requirements of the plaster material are that it contain sufficient permeability to provide a ready egress for all air and gas in the mold during pouring; that it be sufficiently strong to withstand the metal without distortion until the metal sets; that it be sufficiently weak so that it will collapse during the shrinkage of the casting after solidification and thus avoid setting up cooling stresses; and, lastly, that the material be devoid of moisture.

To meet these standards, the process makes use of a mixture containing about 79 per cent calcined calcium sulphate (a form of commercial gypsum plaster), 20 per cent magnesium silicate (a fibrous strengthening agent) and 1 per cent of a devil's brew that accelerates setting of the mixture.

The voids in the mixture are created by adding water, then drying out all the water, the space previously occupied by the water creating a network of spaces that



BRASSES in plaster, showing gating arrangement of parts of a mold unit. Note small feeders.

has proved most effective as a passageway for gases to leave the mold. These voids could be achieved by other means. As a matter of record, early experimenters have used ashes for the purpose of providing passageways for the egress of the internal air and gas. But water has proved to be the most effective method.

The gypsum plaster and silicate fiber are mixed dry in a rotary mixer on the upper floor of the foundry building. The water is treated nearby by a purifying process until it can be described as chemically pure.

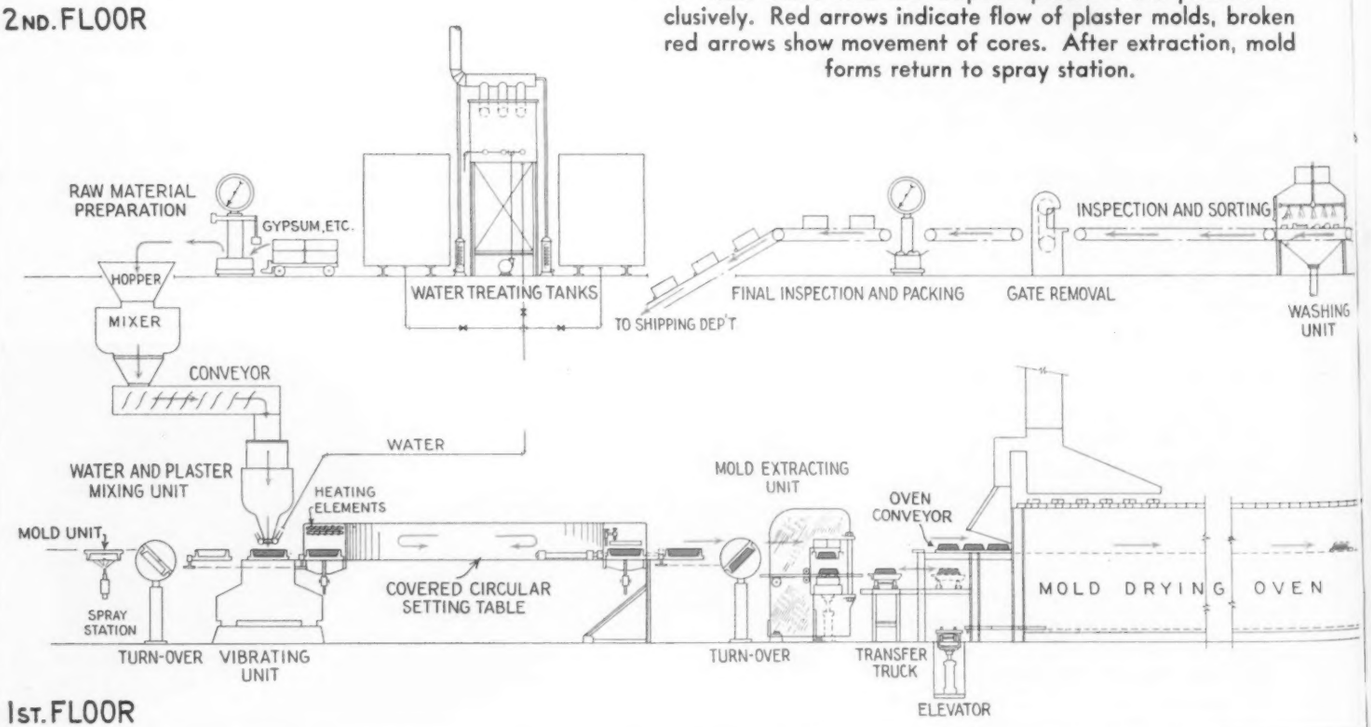
The water is added to the plaster at the rate of about 180 parts of water to 100 parts of dry material. On a weight basis, this would mean a mixture of 6.3 lb. of plaster to 11.6 lb. of water.

The amount of water added is substantially in excess of what would be required to enable the mixture to set. This excess is deliberate, however, for it increases the number of voids left in the material after drying. From this it is obvious that a form of control over the permeability of the mold material is possible by adjustment of the amount of water added, between the limits of what is necessary for a setting of the plaster and the maximum which can be removed during the drying process.

With the standard water-plaster mix described above, the volumetric ratio of solid material to voids in the baked molds is about 1:5. Experimental molds have been made with ratios varying from 1:3 to 1:6, but it was found that a ratio of 1:5 presented the ideal conditions of strength and permeability.

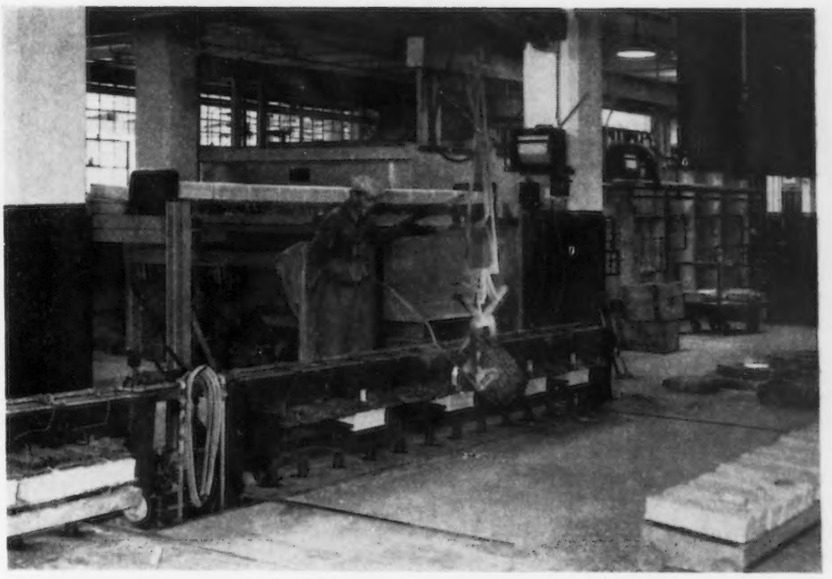
The dry materials are mixed in

LAYOUT of the new Briggs Mfg. Co. foundry in Cleveland which uses the Capaco plaster mold process exclusively. Red arrows indicate flow of plaster molds, broken red arrows show movement of cores. After extraction, mold forms return to spray station.



a vibrating hopper and fed in automatically measured amounts into the mold. Water is then added and the entire mold subjected to a violent, vibrating action which thoroughly mixes the water and solids. The entire mold is then slid off the vibrator and onto the circular setting table. Here it is slowly moved through a tunnel which is electrically maintained at 160° F., requiring eight minutes to travel the circle. When the mold leaves this setting table it is somewhat solid to the touch, but it can be dented by a finger with slight pressure.

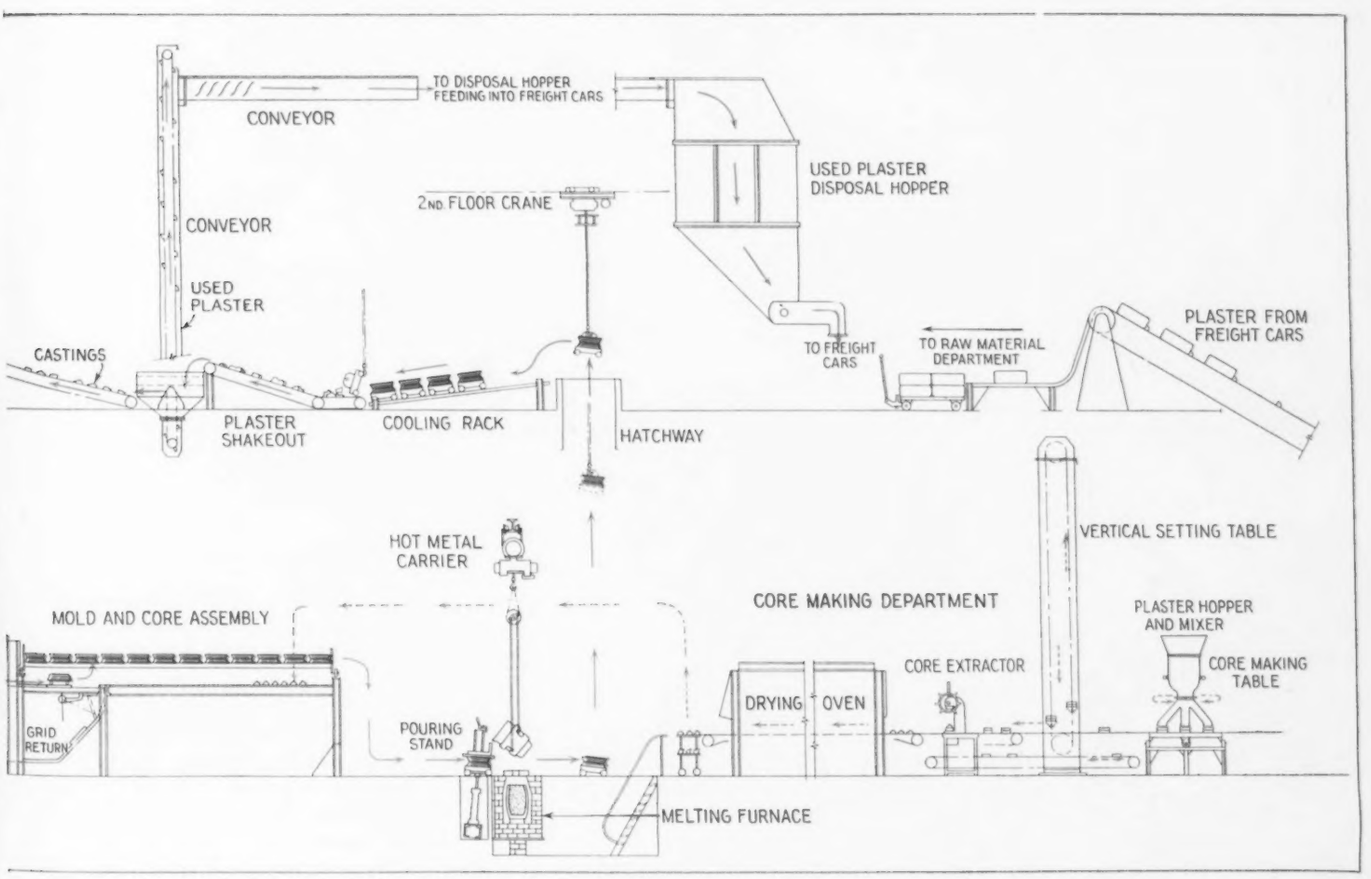
Automatic equipment moves the mold from the setting table to a device known as an extractor whose function it is to separate the mold from the mold box (or flask). Before entering the extractor, the mold is reversed so that the metal bottom of the container is held upward in the extractor by a magnetic chuck. In this position, the platen of the extractor moves upward until it comes in contact with the under or open side of the mold. Vacuum is then applied to the platen surface, which is ribbed to provide a greater area for the vacuum to work on, thus increasing its hold. The extractor head is then slowly moved downward, extracting the mold from the flask.



MANNER of using a pouring stand is illustrated above. Operator is pouring molds locked in the stands, while at lower right can be seen a buggy with molds that have been poured. Immediately behind the operator is another buggy waiting to be placed in the stand. To the right center can be seen the oven, with the exit end immediately behind the operator.

No direct pressure is employed in this operation, except that required to cause the ribbed surfaces of the platen to bite into the mold bottom.

Before the water and plaster are



added to the mold, all surfaces of the flask pattern coming into contact with the mold materials are sprayed with a parting mixture to prevent sticking when the mold is withdrawn. The spray mixture is an extremely vital part of the process. Without it, it would be impossible to obtain a clean extraction of the mold.

The mold is still somewhat soft when it leaves the extractor and in this state it is placed in the oven conveyor. The drying oven, which is 74 ft. in length, is the radiant tube type designed by Continental Industrial Engineers. Fired by natural gas, the furnace is divided into two heat zones. The first is a high heat area where the temperature is held at 1450° F. while the second is a recalcining zone with a temperature ranging from 450° to 500° F., tapering down to close to room temperature at the exit end. The mold surfaces during baking in the first zone, lose none of their original fine lustre in spite of the high temperature to which they are exposed. The mold remains in the high heat zone about 20 min. and in the recalcining zone until the interior of the mold attains a temperature of 350° to 400° F. for about 1 hr. and 20 min.

For some time the theory was held that proper drying could be obtained only by slow drying, taking as much as several days' time. It has been proved in the oven used by the Capaco process, however, that satisfactory drying, without checking or cracking of the mold, can be accomplished in 1½ hr., removing a serious hindrance to the commercial development of the process. This is one of the unique features of the Capaco system.

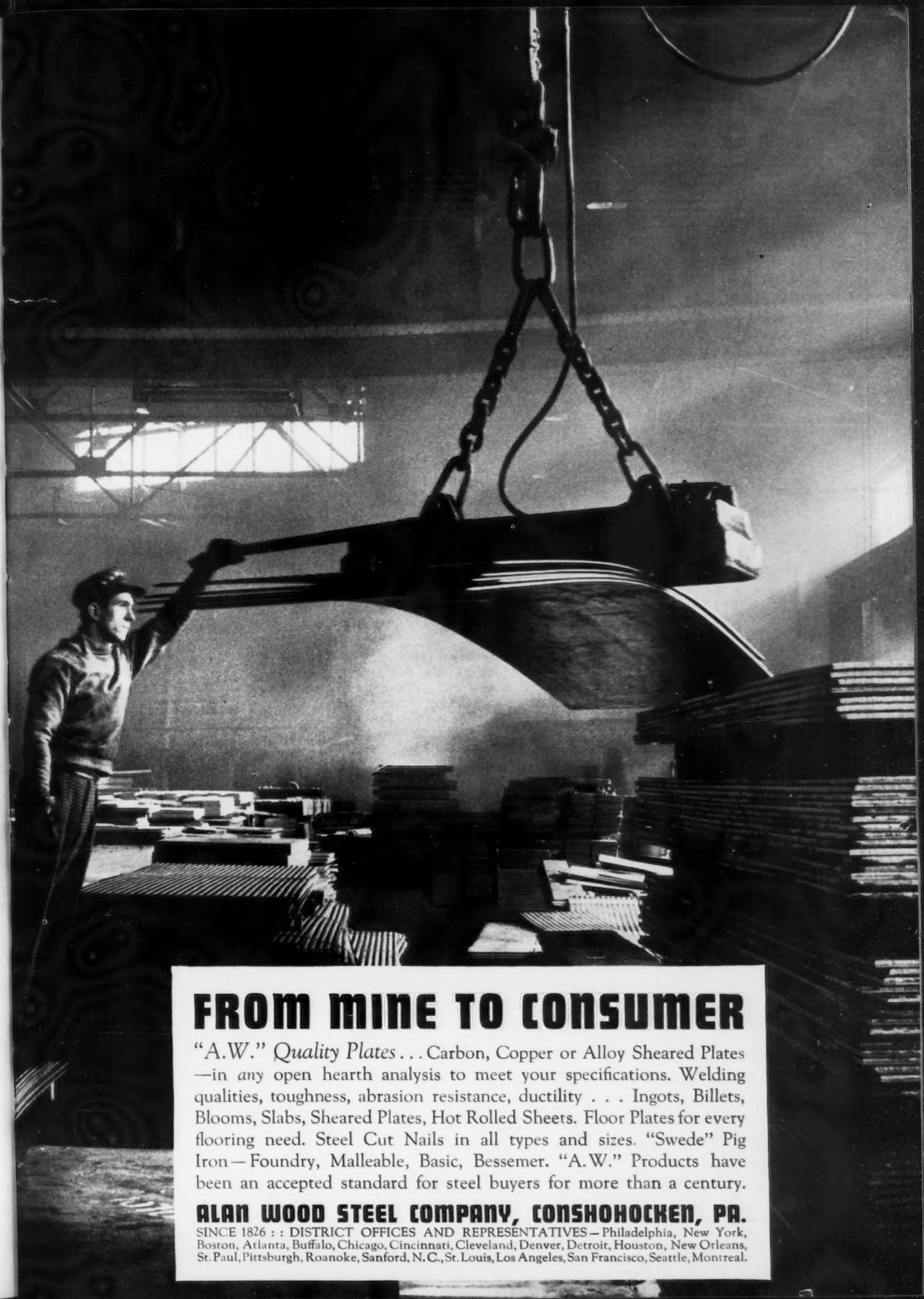
BRASS gear segment with legs cut to show absence of strain.

A factor in the speedy drying of the molds is that an effort is made to provide for large volume exhausting of the drying area to assure that as soon as the moisture is drawn to the mold surface and converted into steam, it is immediately removed, thus avoiding the development of an insulating strata of steam about the mold which would retard its drying rate. It is claimed that all the added water is removed during the baking, and that all but five per cent of the chemically combined water is also removed. The baking activity is continuous.

A problem in drying a plaster mold is compensating for the contraction of the mold against the expansion of the metal conveyor mold supports which takes place in the high heat zone. Such counter expansions would, if not controlled, result in serious distortion of the mold. The furnace grids used by Capaco are designed with all arms extending outward radially from the same center point. The mold is placed as symmetrically as possible upon the grid. Thus when the

(CONTINUED ON PAGE 154)

GROUP of Capaco castings, showing how some of the more difficult casting forms can be produced in brass and bronze. Several pieces in beryllium copper are also shown. Some of the gears are mating forms. Teeth are shown in as-cast condition, the only machining of castings being to remove gates, smooth parting lines and bore hubs.



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Assembly Line . . .

• Machine tools found piling up through lack of shipping information from Washington . . . Eleven carloads accumulate at one plant over a six-week interval . . . GMC agreement with union pattern for industry.

DETROIT—Among the new defense-born assembly lines of the nation are those which have been created to speed the production of machines and machine tools. So outstanding has been the job done on these assembly lines that (even in a period of much complaining about slowness and shortages) none has been heard directed at the makers of machines.

Visits to some of them last week revealed that in many instances their output is, apparently, far ahead of the government's ability to make up its mind about shipping instructions. Lack of shipping information from Washington, especially on lend-lease goods, has reached a critical stage. The result is a pile-up of new machines in shipping rooms and endless confusion about "who gets what, and when."

The condition exists here and in machine tool plants in Ohio, and is reported from other areas. On the basis of admittedly casual checkups, it is obvious that several million dollars worth of new equipment, ready for delivery and use, has been tied up in just one small area. A single plant reported it had been holding back more than a half million dollars worth of new machine tools in its shipping room, and verified that just a week ago it managed to get necessary shipping information to start eleven carloads rolling to the docks to become part of lend-lease cargo. These eleven carloads had been accumulating for about six weeks.

ANOTHER plant had on hand a half dozen completed machines, less electric motors, and found that it would have to wait another two months for the motors. Informally, it was told that it could ship these to other customers, provided it had an equivalent number of machines ready when the motors are delivered.

Most of this held-up equipment is destined to be shipped under lend-lease, and therefore awaits the signing of orders by the President, who disposes of this lend-lease material under provisions of the act which designate him as sole authority. "Down the line," however, it is reported that the necessary papers sometimes are delayed weeks before they are through all the formalities.

Some of the delays are on defense tools for domestic use, and appear to result from OPM confusion and lack of co-ordination of industrial buyers and the government. For instance, an OPM order came out last week directing the shipment of two machines to an automotive defense plant in March, 1942, but one of the machines had already been shipped on Sept. 29. It might be added that the buyer had been clamoring for immediate delivery for many weeks, but now probably won't get the second machine until the OPM's delivery date rolls around since there is need for the machines in other plants.

Incidentally, it is learned from a machine tool man who is extensively acquainted in the Southwest, many large modern machine shops in the oil country are operating at only 30 per cent of capacity and ought to be able to handle important precision work on large parts if given a chance.

THE auto industry can be expected to look with great favor on any reasonable plan for allocation of materials because a steady flow of materials into its plants is virtually a necessity to assure movement of the assembly lines. Undoubtedly, however, it is going to want to know who is going to administer the allocations before it gets enthusiastic. Already it has felt a heavy-handed OPA attempt to use raw materials control to direct some of its advertising practices.

The circumstances under which this interference with business occurred are so unusual that the Detroit principals don't want to invite reprisal by talking too much and getting their names in print. It is enough to say that priorities, and the general control over materials exercised in Washington, was used as a club by a single dictatorial individual in Washington to force obeisance in a matter of taste and opinion *not* connected with the defense program.

The threat was potent enough, so it succeeded; it is still potent enough to keep the victims quiet. It is not within our power to say more, but it is hoped that they will decide to air the subject thoroughly as a defense against further encroachment and abuses.

Certainly not malicious, as the above, but nevertheless an evidence of maladministration of priorities is an instance cited recently when a machine tool builder tried vainly to get plate steel for his production. He couldn't get delivery because the material was being shipped to a point on the West Coast—where there were no facilities for unloading it. Here, too, as in many other cases recently, the complaint concerned the navy practice of buying far in advance of normal requirements, and insisting on having all plate "on the ground" before a keel is laid.

THE agreement reached last week between General Motors Corp. and the UAW-CIO for protection of workers' seniority status in transfers to defense jobs will serve as a pattern for the entire industry, according to hopes expressed by the union. Representatives of management, the labor division of OPM and the UAW were meeting Monday to consider such plans. This would mean a general observance of the seven-point program dealing with layoffs, transfers, seniority, rehiring, and defense training, embracing policies recommended by OPM and outlined at hearings of a

14 POINTS on SPECIAL TAPS

OLDSTERS remember Woodrow Wilson's "14 points." Here are 14 that are often overlooked, which have to do with ordering special taps. If you can remember to check each one when you order (and furnish a sketch or blueprint, too) your special taps will be *right* and properly suited to the work to be performed.

1. State exact cutting size, number of threads per inch, and form of thread. (If Multiple Thread, state the *lead* in inches and whether Double, Triple, etc. Example: 1"—8 Acme ¼" Lead Double.)
2. Is right or left hand thread required?
3. What style of tap is wanted, Taper, Plug or Bottoming Hand Tap, "Gun" Tap, Nut Tap, Tapper Tap, Pulley Tap, etc.?
4. Should taps be High Speed or Carbon Steel?
5. Are taps to be furnished with cut or ground threads?
6. If threads are to be ground, what class of fit is to be produced?
7. What is overall length; thread length; and style, length and diameter of shank?
8. How many flutes, if not standard, and shall they be straight, spiral or "*Gun*?"
9. If spiral flutes are wanted, should they be right or left hand spiral?
10. What length of thread is to be cut?
11. Will tap be used in "through" or blind holes?
12. What is size of hole before tapping, and what is depth of hole to be tapped?
13. What kind of material is to be tapped?
14. Are taps to be used by hand or in a machine? If machine, advise type.

You can give most of the information briefly and correctly on a simple sketch like this.

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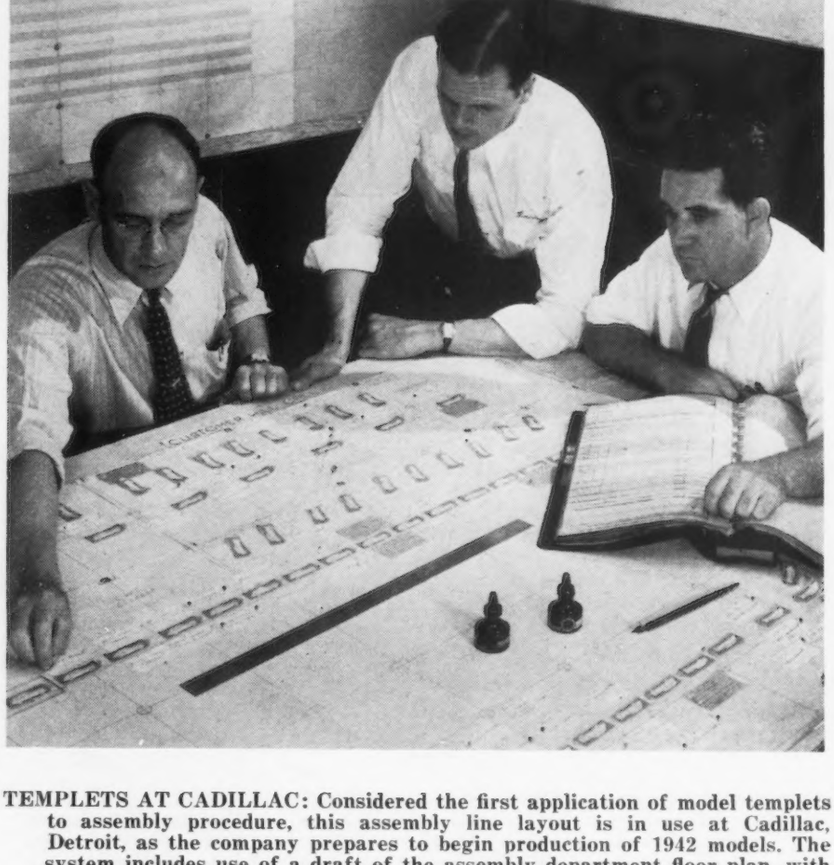
This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known



TEMPLETS AT CADILLAC: Considered the first application of model templets to assembly procedure, this assembly line layout is in use at Cadillac, Detroit, as the company prepares to begin production of 1942 models. The system includes use of a draft of the assembly department floor plan, with obstructions noted at a scale of one-eighth-inch to a foot. Templets of the equipment, cut to floor area scale, are mounted on the board. From these layouts and time study, according to A. A. Weidman, superintendent of final car building, it is possible to post the theoretically perfect distribution of man power. In this photo, three Cadillac men are shown making plans for 1942 production.

congressional committee here recently investigating migrations of workers and unemployment incident to change-over to defense work. The formula does not upset current labor contracts, but recognizes special problems and attempts to cope with them.

The latest in a series of 15 strikes in 61 days, all of the wildcat variety, occurred last week in the Briggs Mack Ave. plant when the management there tried to carry out union contract provisions with regard to transfers and layoffs. It was faced with the necessity of cutting the staff as a result of government-ordered curtailment.

The strike was the second in two days, and exactly duplicated the first. It was settled when the company fired 12 or 15 strike leaders, with the blessing of union officials.

BRIGGS management has been plagued by similar disturbances lately, and more than 170,000 man-hours of work have been sacrificed by actions of these wildcat strike instigators. (Losses at Plymouth are not included in this figure.) In addition, there has been a veritable epidemic of slowdowns.

Union leaders are upset because of their lack of control. There seems to be little chance for them to wipe out these wildcat strikes because the small groups of strikers are literally fighting for their jobs.

Another recurrent strike has been at Dodge, where the workers in a paint department are complaining about imperfections in the ventilation system. The management says new equipment is on order, but delivery delays are being caused by priorities. By the time the equipment for the ventilation system is delivered, the curtailment of auto production may have gone so far that there will be no autos, no paint, no work, hence no fumes.

The tendency of some people, labor leaders included, of course, to worry needlessly, was illustrated here recently by a British labor leader who was touring the country's defense plants as an OPM guest. Apparently he had scanned every one of the new defense plants with a critical eye. Long rows of machines, smoothly flowing assembly lines, well-lighted, ventilated plants were impressive—but he worried. Finally it came out that he just hadn't looked high enough —off the floor, up at the beams and skylights.

"Canteens," he said, "canteens and washrooms and toilets?"

Well, we have 'em, even the canteens. In fact, one beverage manufacturer, at least, has top priority rating so he can get materials and equipment to manufacture Coca Cola dispensing machines. The explanation offered for the holding of a high rating is that the machines go into defense plants and army cantonments.

Automobile production held fairly steady last week, declining only slightly to 76,820 passenger cars and trucks, compared with 77,035 in the previous week and 105,153 a year ago when the industry was operating without ceilings, according to Ward's Reports, Inc. Strikes held the level down somewhat, and there may be a slight advance this week, but no great advances are likely to develop between now and the first of the year, the period for which there are specified maximum monthly schedules.

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• • • **Jobs paying as high** as $10,000 a year are finding no takers, the state employment service reports. There are 62 supervisory jobs in armament industries which the service has been unable to fill. Vacancies include division superintendents, plant engineers, general foremen, etc.

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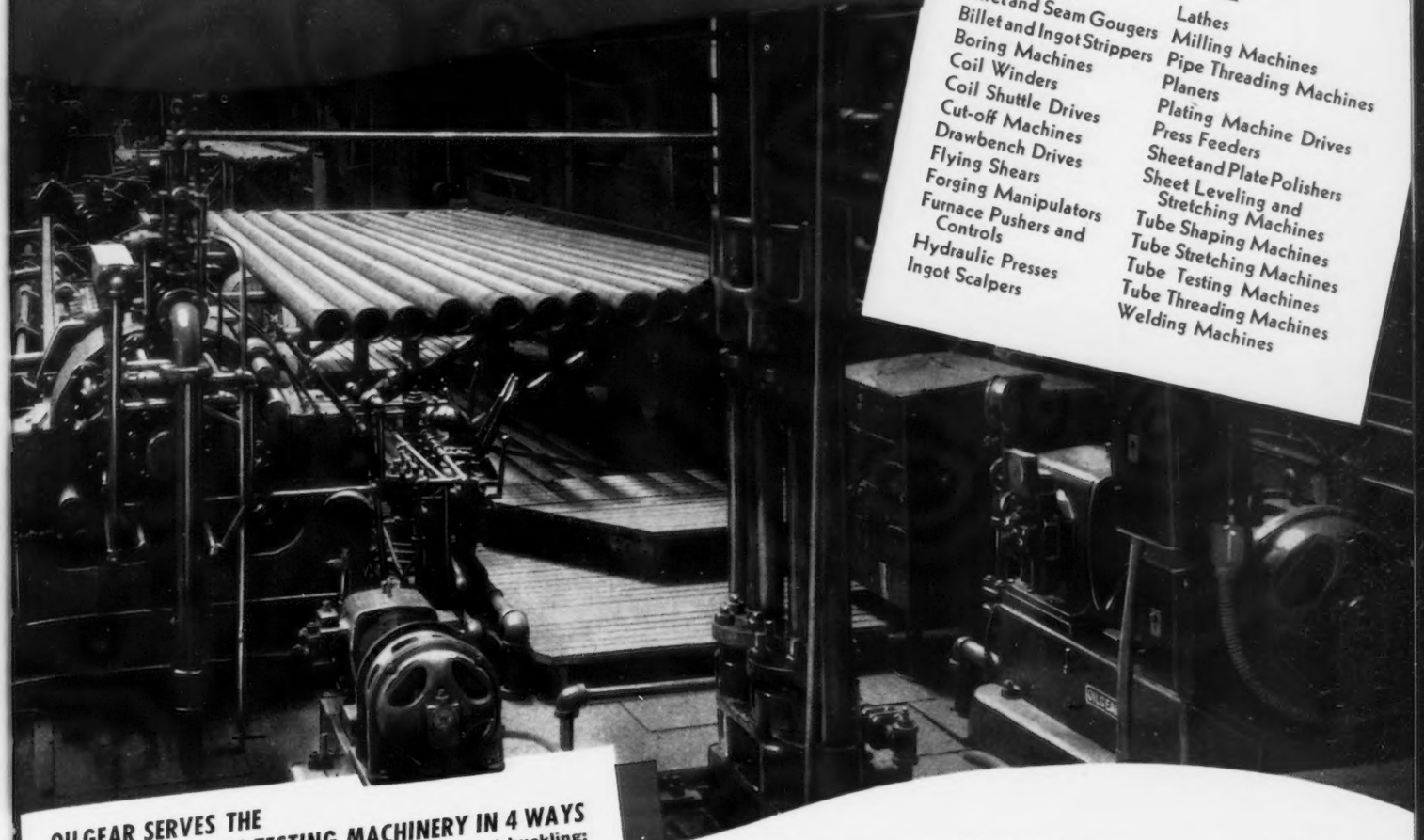

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Ingot Scalpers
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Milling Machines
Pipe Threading Machines
Planers
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Sheet and Plate Polishers
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Tube Shaping Machines
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IF YOU'VE never investigated Oilgear Fluid Power advantages, do so at once. They may solve your toughest power problems. Oilgear Fluid Power Systems are *flexible* in every sense of the word . . . shaped to fit your most exacting requirements . . . and give you better, faster, and more profitable production.

The Hydrostatic Pipe-Testing Machine illustrated on this page, for example, shows one Tube Mill application of Oilgear Fluid Power where the unique control advantages of Oilgear make operations simpler, safer, and more dependable. The chief engineer of its owner reports that he is highly satisfied with the results.

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Washington . . .

• Administration committed to providing steel for all Hitler's foes . . . Hauck report forecasts still less steel for civilian consumers . . . Hitler controls 63 million tons of steel capacity.

WASHINGTON—Approval by SPAB of the 10,000,000-ton ingot expansion recommendation made by W. A. Hauck, OPM Iron and Steel Branch consultant, means that the Administration has adopted an all-out steel increase to overcome Hitler. Whatever may be the merits over the controversy for and against further increase in output, the decision has been reached that this country proposes to provide itself and other countries opposing the Axis powers with more war steel than Hitler can possibly provide as long as hostilities endure.

It, of course, is not just a matter of over-matching Hitler in sheer tonnage. Far more than that is involved. The material has to be fashioned into instruments of war, aircraft, tanks, guns, ships, etc., and these operations require plants, equipment, labor and time. This is where for six long years Hitler got a tremendous advantage. While "world statesmen" slept, or were complacently indifferent, or too busy keeping political fires burning at home, Hitler built up the world's most monstrous war machine and armed forces. With this machine thrown into gear it was possible to successfully engage on a conquest so devastating that were it not for its frightful reality, it would seem fantastic.

THE job now is for free civilized countries to build a bigger and better machine, equipment and men, that will overmaster Hitler.

Those who believe additional facilities are necessary for this purpose estimate that the new capacity will require about 2,000,000 ingot tons of "seed corn" for construction. They say the "seed corn" will reproduce itself many times once it has come to fruition. They do not accept the view still held by many that present capacity is ample and that better results would be obtained by concentrating on it without having to draw upon new requirements for material, equipment and labor. They reject the opinion that, if properly administered, there is enough steel capacity for all defense requirements with much left over for civilian use.

It is conceded that for military or other reasons there might be large requirements for steel that have not been disclosed, but in the absence of a specified program there remains doubt that increased capacity, orderly adjusted for production and distribution—the SWOC permitting—is necessary. Right or wrong the opinion exists that there is a great deal of expansion hysteria abroad. The report was like a dash of cold water also to those who are anxious to see an upturn in civilian activities and believe it possible without any injury whatever to defense production.

Instead of getting any solace in this direction the report took the opposite turn, declaring that steel available must be correspondingly reduced, meaning that the steel for new facilities—1.3 per cent of capacity for each of the next two years—will be charged against civilian consumers.

THE time element is extremely important. It is not possible to build overnight what Hitler was building for six years. But the machine is being fashioned and it is a matter now of time to complete it and to crush the Hitler machine.

The "arsenal of democracy," it is clear from the Hauck report, proposes to supply the steel—not only by adding 10,000,000-ton ingot capacity with corresponding additions to finishing facilities, but, if necessary to raise the capacity by still another 5,000,000 tons.

Being a world supplier of steel is a Herculean task, which some think is wasteful and harmful to our own defense but it has been embarked upon nevertheless and must be accepted. If sheer tonnage is ultimately to be the deciding factor, and it definitely will be a highly important factor, Hitler has the scales balanced heavily against him already. For with all his conquests he has only about 63,000,000 tons of steel under his control while the United States alone will have 100,000,000 tons.

↓ ↓

Washington

• • • OPM's Division of Priorities has issued an interpretation that cooperative utility companies may use the priority assistance provided in Preference Rating Order P-46 (the maintenance, repair and supplies plan for utilities). Since the original plan was issued for certain utilities, a number of questions have been received as to whether or not the assistance can be used by cooperative or "membership" companies supplying services to their stockholders or members only.

The interpretation states that such companies are included in the order, provided that the company offers service within its service area to any person applying for it in accordance with the producer's rules and regulations.

↓ ↓

Washington

• • • The Defense Plant Corp. has announced the following lease agreements made for the War Department:

Jacobs Aircraft Co., Pottstown, Pa., $13,056,327 for construction and equipping plant in Pottstown for the manufacture of aircraft parts. Approximately $8,053,021 will be used for equipment and $5,003,306 for land and buildings.

Briggs Mfg. Co., Detroit, $1,046,143 to be used in plant in Detroit for production of aircraft parts.

Fleetwings, Inc., Bristol, Pa., $354,035, for additional facilities in Bristol to manufacture aircraft equipment.

The Heckett Corp., Philadelphia, $100,000 for addition to equipment to be used on projects at Coatesville and Butler, Pa., and Middletown, Ohio, in the reclamation of iron and steel scrap. Present commitment, $350,000.

Help

KEEP TOOLS SHARPER...LONGER

with **SUNOCO** EMULSIFYING CUTTING OIL

SET A HIGHER P-Q* WITH MORE PIECES PER TOOL GRIND

Now more than ever it's important that you set a higher P-Q* (Production Quota) for your small tools . . . that they stand up and deliver under fast, heavy cuts.

"Down time" for resharpening and resetting is waste time . . . lost production! That's why leaders in the metal working field today are relying on SUNOCO Emulsifying Cutting Oil to help reduce "down time" and meet defense production schedules.

SUNOCO's remarkably high lubricating and heat absorbing qualities prolong tool life. It rapidly carries away heat . . . prevents chips from seizing . . . permits faster stock removal. With SUNOCO tools cut cleanly, evenly . . . maintain close tolerances and fine finish. The result . . . fewer rejects.

Follow the leaders! Help get more pieces per tool grind with SUNOCO and pave the way for a higher P-Q*. A SUN Cutting Oil Engineer will be glad to arrange a test run in your own plant . . . under your own operating conditions. Write to

SUN OIL COMPANY · PHILADELPHIA

Sponsors of the Sunoco News Voice of the Air—Lowell Thomas

PERFORMANCE DATA

OPERATION:
4 cuts 2" to 5/8" diameter Multiple Cutter Turner.

MACHINE:
Warner & Swasey No. 5 Universal Turret Lathe.

MATERIAL:
S.A.E. 1315 steel.

CUTTING SPEED:
103 S.F.P.M.

CUTTING LUBRICANT:
1 part Sunoco to 20 parts water.

OPERATOR + MACHINE + RIGHT CUTTING OIL = P-Q* PRODUCTION QUOTA

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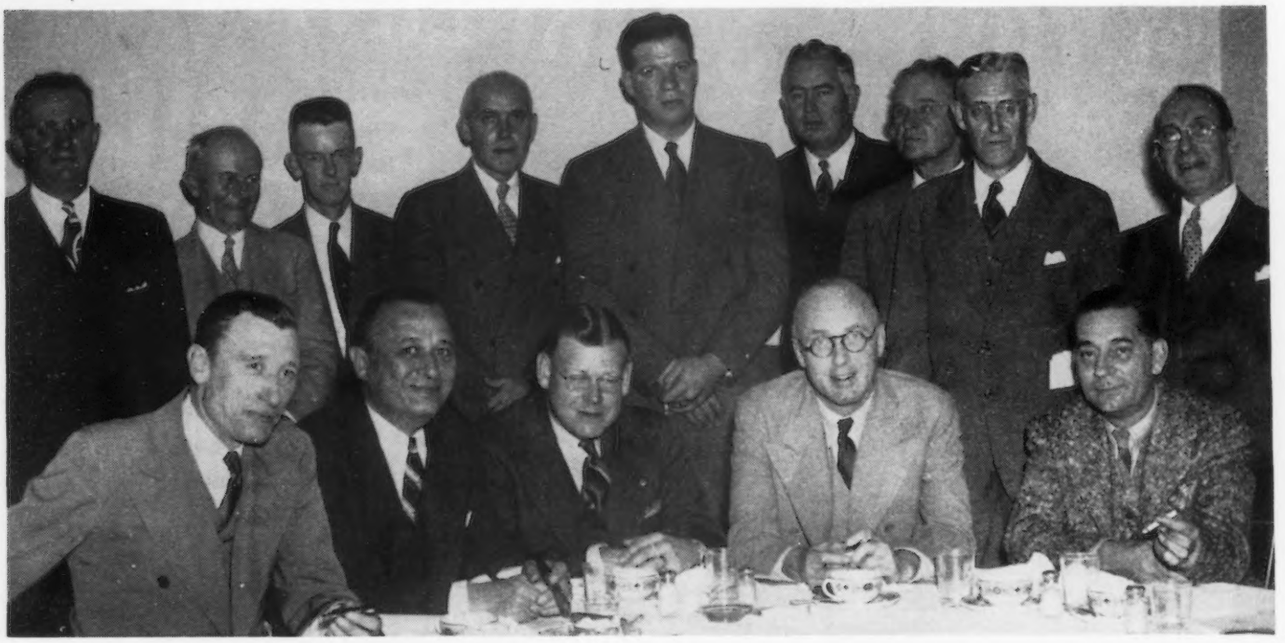
PETROLEUM PRODUCTS FOR ALL INDUSTRIES



ADVISORS ON SUBCONTRACTING: Floyd B. Odlum, director of the OPM's contract distribution division, met recently with the Small Business Advisory committee to discuss small industry in relation to defense. Above, left to right: I. L. Johnson, Berkley, Cal.; Ben Abrams, New York; Chairman Walter W. Finke, Minneapolis, Minn.; Floyd B. Odlum, W. B. Connell, Kansas City. Standing: P. W. Grassel, Chicago, Ill.; Alfred I. Gaunt, Methuen, Mass.; T. J. Storke, Richmond, Va.; Harry C. Keiner, Richmond Hill, N. Y.; Boyd Bridgewater, Akron, Ohio; J. H. Wilson, Wichita Falls, Tex.; D. R. Yarnall, Philadelphia; A. D. Kennedy, Atlanta, Ga.; and S. Alva Moog, St. Louis, Mo.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

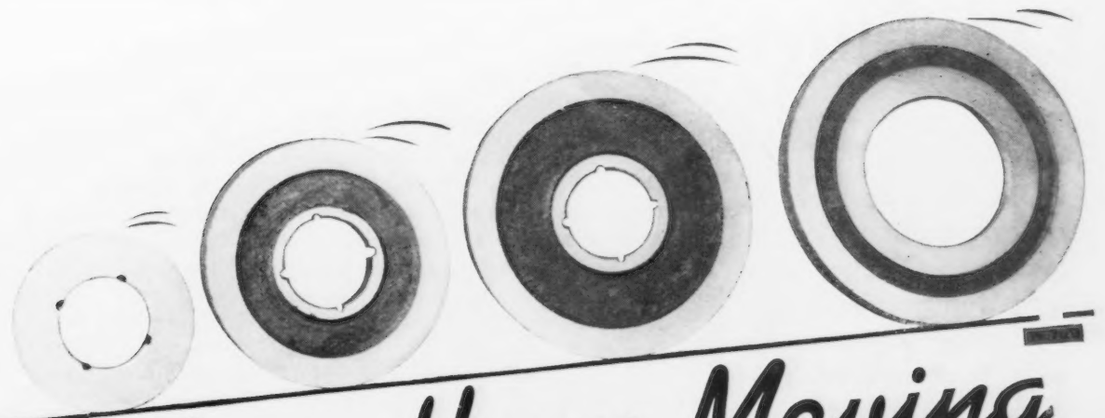
Regulations Governing Payroll Records Revised

Washington

• • • **The Labor Department's** wage-hour division has complied with the requests of certain large employers that requirements for keeping payroll records be simplified under the law, but at the same time revised its record-keeping regulations to seek additional information in some respects.

Embodied in an explanatory booklet "How to Keep Wage and Hour Records," the changes permit employers paying on a semi-monthly basis to record daily instead of total weekly straight-time earnings.

Under the revised regulations, employers are required to "preserve for at least two years from the last date of entry the originals or true copy of any and all customer orders or invoices received, incoming or outgoing shipping or delivery records, as well as all bills of lading, and all billings to customers (other than 'cash') which the employer retains or makes in the course of his business or operations."



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WITH BLANCHARD SURFACE GRINDERS

The largest manufacturer of automobiles in the world keeps transmission gears moving down the line by using Blanchard No. 18 Surface Grinders for grinding the gear faces. These machines not only assure maximum production, but easily give the accuracy necessary (parallel within .0005") for subsequent operations. Both faces of several size gears are ground on Blanchard No. 18 Grinders, .020" of stock being removed from each surface. Production on the 3½" gear is 250 (500 surfaces) per hour — and changing from one size gear to another involves practically no down time. Blanchard production estimates are yours without obligation — just send samples or blueprints to

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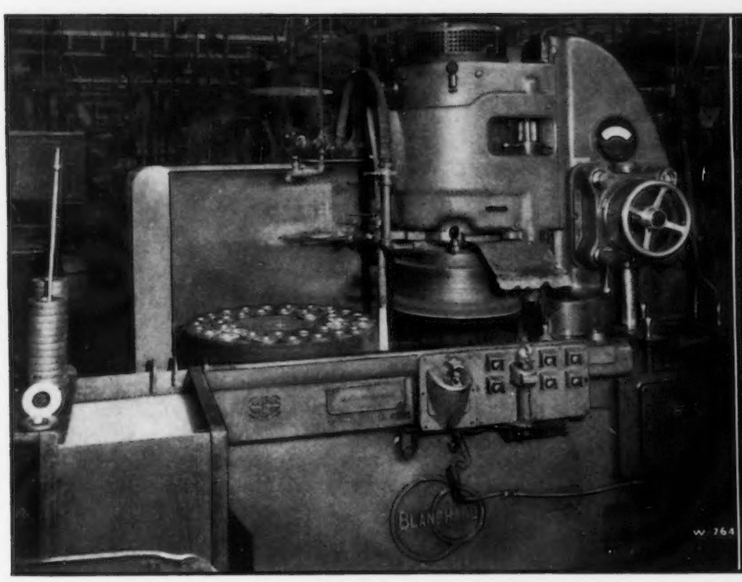


WEST COAST.

• New ingot capacity in Pacific area must be quickly built to be effective . . . Higher costs may temper jubilation of some consumers over prospects of having own steel plants.

LOS ANGELES — Indication in the OPM report of W. A. Hauck that an integrated far Western steel industry was desirable for "strategic reasons" puts the question of whether or not it is best for the West to make its own steel on an entirely new plane of controversy. Heretofore, the question has been tied up with public power, local pride, creation of new jobs, but the final test has always been the consuming ability of the far Western market.

Now that the matter has apparently been settled on the basis of military strategy, recriminations are sure to be heard from some quarters, and the time element will be the determining factor as to whether they are justified. A readily available supply of steel on the Pacific Coast, particularly in such classifications as wide plates, would undoubtedly free rolling stock for other transportation requirements and badly needed ship cargo space would become available for other uses. If new capacity can be constructed in the West while these two objectives are still to be desired above all things, then, expansion for "strategic reasons" will have justified itself.

If, however, the contention of Walter S. Tower, president of the American Iron and Steel Institute, that appreciable capacity increases cannot be made effective before 18 months at the earliest applies to the far Western expansion, and if, when the new capacity is in operation the emergency is over, or if the emergency ends shortly thereafter, then the new capacity may be a permanent burden on the far Western steel industry.

Possibly some new capacity can be built to produce iron and steel at unit costs slightly less than or not a great deal larger than those encountered in bringing steel from the East. Any large increase in proportion to present capacity must of necessity raise production costs not only on the steel made in new facilities but on all steel produced on the Pacific Coast. High cost steel in most cases means high priced steel for the average buyer, and if Western industry is brought face to face with high priced steel it will quickly lose any jubilation it may temporarily feel over having its own steel works and mills.

AT the annual American Mining Congress at San Francisco last week coke produced from coals mined in the State of Washington entered the discussion. "In so far as the Pacific Northwest States are concerned, one of the many arguments advanced in opposition to the location of new iron and steel capacity has been related to the supposed poor quality of coking coals found in the region," declared Ivan Bloch, chief of the Bonneville Power Administration's market development section. "Recent thorough investigations and experiments by reliable agencies—private and federal—have proved that coking coals in the State of Washington will produce satisfactory metallurgical coke entirely suitable for blast furnace operations." Although the speaker talks of blast furnaces, one might suspect that his real interest is in electric iron furnaces using government hydroelectric power.

Although there has been dislocation of labor and there is an increasing dislocation of production as a result of material scarcities and priorities on the Pacific Coast, one of the most remarkable economic changes, not yet noted by many, is the diversion from normal channels of the flow of capital investment. Added to changed investment habits as the result of defense preparations as a whole, these new investment habits may have considerable influence on the state of the national economy when the defense boom is over.

In the first place, building and tooling of industrial plants during the last two years has been carried on largely without the aid of private capital. Some of the first big plant expansions were entirely or partially privately financed but the more recent expansions, and the larger ones, have been made entirely through borrowings from the Federal Loan Agency. Both a private bank and the Federal Reserve Bank have estimated for THE IRON AGE that in the far West not more than 10 per cent of industrial plant expansions since the beginning of the emergency have been financed by private capital.

TURNED aside from the normal outlet of financing plant expansion, the defense program has opened up a big new avenue for the banks. This is the financing of government contractors, taking in large measure the form of advances on government contracts. A San Francisco banker frankly declares that, in making this type of loan, the use of a contractor's assets as the yardstick by which his credit is measured has had to be sharply revised, and that it has become widespread practice to make loans greatly in excess of a firm's assets on the basis of large government contracts. In fact, a case was reported in which a firm had no assets but a fat government contract, and a substantial bank loan was secured.

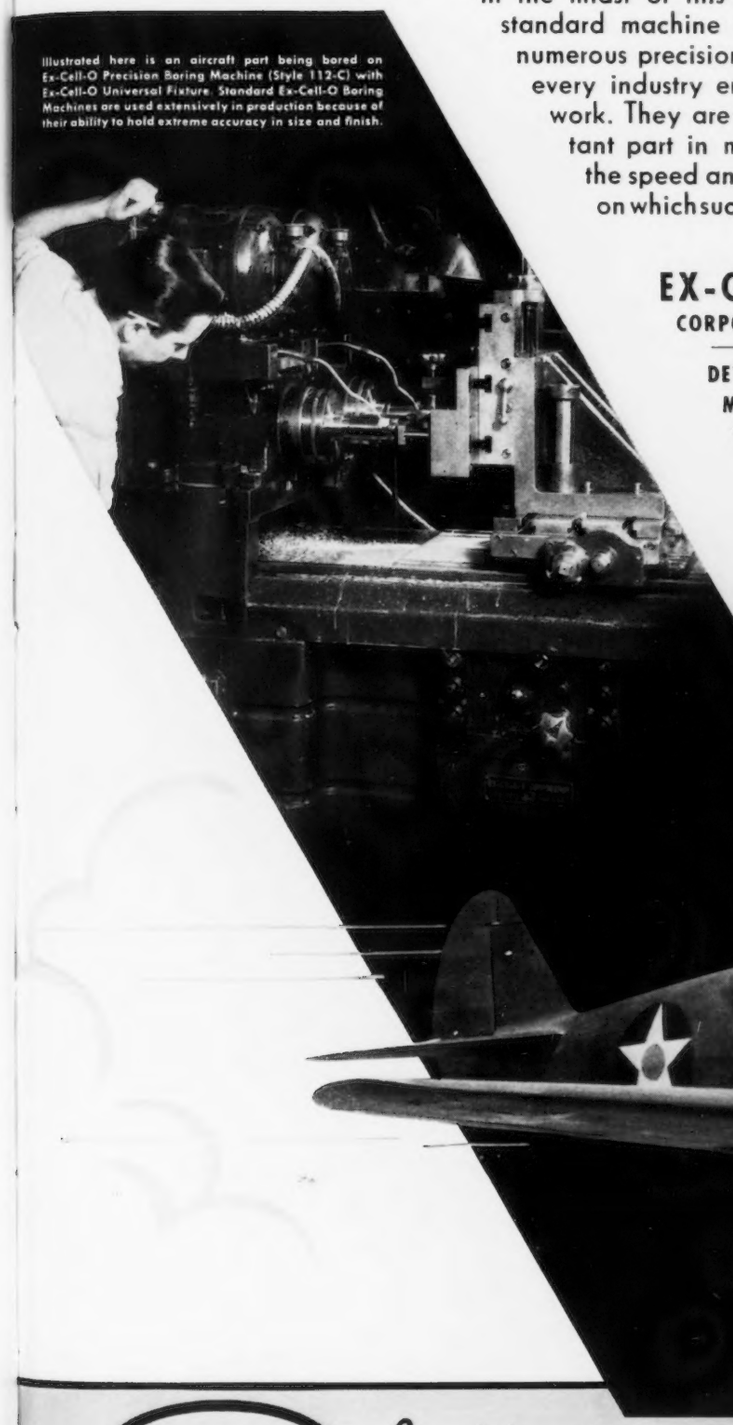
Long term economists, who like to pedal business cycles, because of this phenomenon, may be able to see an ending to this boom period differing from some of those in the past. Private capital will not be frozen in over-expanded industrial plants; misdirection of investment as related to more stable times, will be held to a minimum, for the gov-

PRECISION PRODUCTION
. . . — *vital to* VICTORY

The swift and gigantic steps that American industry is taking in the program for national security are largely due to the *precision production* of metal parts. When the present emergency is ended, the record will show that one of the outstanding accomplishments was the production of defense material, not only in stupendous quantities but with each vital metal part repeatedly held to an extremely high standard of accuracy in size and finish. Today, in the midst of this emergency, Ex-Cell-O standard machine tools are performing numerous precision jobs in practically every industry engaged in defense work. They are taking an important part in making possible the speed and accuracy upon which success depends.

EX-CELL-O
CORPORATION

DETROIT
MICH.



Illustrated here is an aircraft part being bored on Ex-Cell-O Precision Boring Machine (Style 112-C) with Ex-Cell-O Universal Fixture. Standard Ex-Cell-O Boring Machines are used extensively in production because of their ability to hold extreme accuracy in size and finish.

Picture below shows one of many precision parts being produced for airplanes on Ex-Cell-O Standard Thread Grinding Machines (Style 31 is shown here). Precision thread grinding is now universally employed in the production of all vital threaded parts used in aircraft.

The plane illustrated to the left is the Curtiss P-40, a single seat low wing pursuit plane, many of which are being produced daily by the Curtiss-Wright Corporation. Ex-Cell-O precision machines, producing close-limit aircraft parts for this plane, are shown above.

XLO

Precision THREAD GRINDING, BORING AND LAPPING MACHINES, TOOL GRINDERS, HYDRAULIC POWER UNITS, GRINDING SPINDLES, BROACHES, CUTTING TOOLS, DRILL JIG BUSHINGS, PARTS

ernment is handling most investment which seems out of tune with normalcy; loans made as advances on government contracts, for the most part with short terms, will be paid off as the government takes deliveries. Thus, the country should be spared from many of the pains incident to liquidation felt after the boom of the 20's, and the banks should be in good condition and with relatively few white elephants on their hands. At least, that's one rainbow that may be held out to those who dread the day defense spending ends.

A second diversion of capital, according to bankers, is resulting from diversion of material and productive facilities to defense. Small investors, who normally would invest their funds in real estate and building, more and more are being restricted in this type of activity because of scarcity of certain types of building material. Particularly in those areas which have not been designated as defense areas and for which no favor is given, scarcity of some types of material, for instance, builder's hardware, is becoming acute. Nor does this restriction affect only small investors. A large insurance company has prepared to construct housing projects in San Francisco and Los Angeles, together to cost nearly $25,000,000. If, as seems probable now, inability to get necessary materials forces indefinite postponement of these projects, this money will either have to remain idle or be invested elsewhere. The net result of capital diversion among small investors apparently would seem to be a tremendous surge toward government bonds. The only alternative is complete liquidity. Here again, compared to the end of the boom of the 20's, the result should be favorable on the economy as a whole.

A GRAPH form survey of machine tool equipment in metal working plants in southern California has been compiled and published by the Industrial Department of the Los Angeles Chamber of Commerce. Over 400 plants are listed vertically and 22 classified groups of machine tools are listed horizontally in the chart book, making it possible to tell at a glance not only the facilities of any given shop, but also where and in what numbers any given type of machine tool may be found.

Types of machines listed are automatic screw machines, hand screw machines, boring mills, drilling machines, gear cutting machines, grinders, lathes (bench), lathes (engine), lathes (polishing), lathes (spinning), lathes (turret), milling machines, planers, punch presses, shapers, brakes, shears, heat treating equipment, plating equipment, welding equipment, power hammers, and hydraulic presses.

Distribution of the survey is confined to prime contractors and procurement officials of defense material, under the set policy of Army, Navy and Air Force to deal directly with their suppliers, according to the Chamber.

BRITAIN MASSES ITS TANKS: Thousands of British tanks, according to cutlines approved by the censor, are shown here recently lined up in mass review somewhere in England.

Photo by International

The HEAT-TREAT is the KEY to PRODUCTION!

Where Performance and Output Count Most...

AJAX HULTGREN leads the Parade...

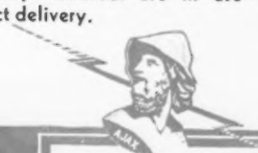
At the "AJAX BOOTH 211" of the Metal Show...

You'll learn about the astonishing new way to do two jobs at once—brazing and carburizing steel assemblies in one operation . . .

You'll understand why almost every production plant has adopted the Ajax-Hultgren furnace for hardening molybdenum high speed steel tools . . .

You'll see specimens of vital defense products treated in Ajax-Hultgren furnaces—artillery shells, carburized armor plate, aircraft engine parts —tank, machine-gun, and airplane structures . .

Meeting our engineers, you'll know quickly *how* and *where* an Ajax unit fits your job . . . *why* so many hundreds are in use—and *when* to expect delivery.



HERE ARE THE KEY PROCESSES TODAY...

SIMULTANEOUS BRAZING & CARBURIZING
•
NEUTRAL HARDENING
•
CYANIDE HARDENING
•
SELECTIVE HEATING
•
AGE HARDENING
•
TEMPERING
•
HARDENING HIGH-SPEED STEEL TOOLS
•
ANNEALING
•
BRAZING
•
HEATING FOR FORGING

1 SIMULTANEOUS BRAZING AND CARBURIZING

It remained for Ajax engineers to discover the rather startling fact that ferrous or non-ferrous assemblies could be brazed together by the very simple process of dipping the assembly into an Ajax-Hultgren Salt Bath. This discovery was followed by additional research, and it was found that steel parts could be simultaneously brazed and carburized where desired: Thus two processes are made possible at the unit cost of *one*. Installations described in the leading metallurgical magazines. Write for reprints.

2 HARDENING MOLY HIGH SPEED STEEL TOOLS

Not only was Ajax first to make practicable high speed (tungsten) steel treatment in molten baths, but because of its immediate success, leading metallurgists are agreed that the trend to molybdenum substitutions for tungsten is practical—provided a salt bath is used to prevent any soft skin, decarb, or other surface defects in the tools—plus a guaranteed temperature control within 5 degrees F. You cannot investigate this too soon—it is the most exacting process, calling for the best in equipment.

3 REFRACTORY POTS FOR HIGH TEMPERATURES

Not long ago, the use of molten salt baths for high temperatures was wholly experimental. Ajax refractory pots, in combination with the original immersed electrode principle, enabled use of high temperature heat-treatment for the first time on the production lines. Scores of Ajax-Hultgren furnaces are now in use with refractory pots as small as 10" diameter and as large as 18 feet in length. They are used for various heat treat operations from 1700 to 2400 degrees F. Check our list of users with the Ajax representative.

4 LARGE SCALE UNITS FOR AIRCRAFT INDUSTRY

Large size of heat-treating units is only natural, in view of the stepped-up pace of industry today But Ajax was the first to foresee and design standard salt bath furnaces of the great size now found in daily production. Almost every aircraft plant is now equipped with one or more Ajax-Hultgren units—with pots from 10 to 20 feet in length—for heat-treating aluminum alloy sections, sheets, rivets, etc. And Ajax retains the distinction of installing the largest furnaces of their kind in the country

5 MAINTENANCE COSTS REDUCED TO VANISHING POINT

No device will operate continuously without some minor replacement sooner or later. But Ajax furnaces continue to operate, 8 to 24 hours a day, without a shutdown, for from one to three years and more, depending on the type of work. Practically speaking, then, the cost of maintenance is reduced and held at the vanishing point It is this established performance in eliminating maintenance, plus the further fact that electric power costs are less than gas or oil, that accounts for Ajax-Hultgren leadership in the field today

AJAX ELECTRIC COMPANY, INC.
900 FRANKFORD AVE. • PHILADELPHIA

CATALOG 107 TELLS THE COMPLETE STORY OF THESE FURNACES—WRITE FOR IT

THE AJAX HULTGREN ELECTRIC SALT BATH FURNACE

ASSOCIATE COMPANIES:
AJAX METAL COMPANY, *Non-Ferrous Ingot Metal for Foundry Use*
AJAX ELECTRIC FURNACE CORPORATION, *Ajax-Wyatt Induction Furnaces for Melting*
AJAX ELECTROTHERMIC CORPORATION, *Ajax-Northrup Induction Furnaces for Melting, Heat-Treating*

Fatigue Cracks

BY A. H. DIX

Pressureless Toot

• • • Last week's breast-beating over our own lower-case, light-face errors drained our masochistic batteries for the moment and left us yearning to thump someone else's bosom. So we are eager to wield this handy club placed in our hands by A. Denison Williams:

The steam whistle shown at the right is from the Coca Cola ad on the back cover of the Sept. 20 Saturday Evepost, *which cost $15,000 and which must have been checked by a couple of hundred thousand dollars' worth of advertising talent. But no one, except Mr. Williams, noticed that although the whistle is going full blast, the valve is tight shut.*

Ess Trouble

You, too, The Iron Age, which valiantly battled the superfluous ess in materials handling, **gets infiltrated by fifth columnists and its resistance to the New Barbarism collapses!**

When the educational oligarchy enlarged its jargon to produce "skills" I choked. A collective noun, there is only one skill—it is skill. **When, more recently, some Government (censored) warned the people that they were in danger of losing their "freedoms" I gagged. But when The Iron Age says that the "stainless steel industry recalls the hallowed** quiets **of 1940," I (censored!) You have murdered the language. Bring the torch! Get a rope! A la lanterne!**

—Deac

The extra ess is an attempt to soup up an expression. We faintly recall that Alexander Woollcott pushed the vogue along by using some such phrase as *"the excitements of the moment,"* and lately esses have been piling up like codicils on the will of a cranky octogenarian. Even the puristic Winchell speaks of *"the peril to their freedoms,"* and *Time* writes of the "intricate mechanisms" of an aircraft turbo-super-charger. Any day now you may see reference to the *braveries, courages* and *indomitablenesses* of the British.

But it works both ways. We saved an ess by giving business forecasters a collective neck in the sentence, *"Their disinclination to project their neck is . . .,"* only to have our knuckles rapped by Ernest C. (Clark Controller Co.) Roberts, who asks sardonically if we think prognosticators are a sort of hydra.

And Frank Oliver of the brains department, who says that it is stylish in ordnance circles these days to drop the second ess in shells *(1500 shell a day, etc., just as you don't say, "I caught three fishes),* can't *get the proofroom to leave the ess off. He keeps on sending in his copy without the ess but it always gets back on when it appears in the paper. So you will always see it here as* shells *unless the second ess is dropped due to a lucky typographical error.*

And Ever the Twain Shall Mix

• • • That even one member of our public—18 loyal readers, count 'em—should know enough about Chinese to find the error in the Chinese argument-stopper, *"Ni tung, wo si,"* struck us as nothing less than a short order miracle. But now we have confirmation of what J. M. (Philadelphia Navy Yard) Sheehan told us recently:

> **The many hours I spent with my language teacher in Nanking and Shanghai convince me that the translation is "You east, I west."**
>
> *—Grace Knight, Oiljak Mfg. Co., Montclair, N. J.*

Our diploma in Chinese from the Berlitz School of Languages has been turned face to the wall, and we're suing.

He Threw In a Sparkle

Like the cellophane on cigarettes, book introductions always seem to us to be an obstacle to the main object and something to be gotten out of the way as quickly as possible. When the author writes his own introduction he usually gives the impression of having lost interest in the subject after completing the book itself, but thought he ought to add something, like the preliminary waggles of an uncertain golfer's brassie, just before he slices into the woods. Or when the introduction is contributed by an invited guest, you get the idea that he consented in an expansive moment after a few drinks and wished he was a teetotaler.

But there are exceptions. A violator of the rule that introductions must be dull is George K. Scribner, president of the Boonton Molding Co., who contributes this sparkling introductory paragraph to Gordon B. Thayer's "Plastics Mold Designing":

> Molding problems are like bridge hands—the books make them easy to read and quite logical, but for some reason when you sit opposite your wife that evening all the hands you hold are strangers, no rules seem to apply, and disaster sits on your shoulder, ready to fall into your lap if you are wrong.

Drifts Up to Our Middle

• • • The snowstorm the erring wife struggled through in the third act of East Lynne was only a flurry compared with the blizzard of requests for extra copies that greeted the 4 ft. long priorities chart published in our Sept. 25 issue. Calls for it have been pouring in by short and long distance telephone, wire, mail, and messenger.

We had to put it back on the press, but before doing so we made the latest revisions. If you want a copy of the revised chart, 15c. in stamps sent to us at 100 E. 42nd St., New York, will bring it to you.

Puzzles

The answer to last week's trifle is 4-4/959 min. past 4 o'clock.

Among the Einsteins who found par for the Sept. 25 highway problem entirely too high are J. A. (National Bureau of Standards) Bennett, C. S. (Westinghouse) Hague, A. W. (Youngstown Steel Tank Co.) Kelly, Robert T. (Pittsburgh Tool Steel Wire Co.) Griffiths, and W. D. (T.C.I.) Kelly.

The last-named says this has bothered him for some time and he still doesn't know how to figure it out:

A submarine headed due north sights a ship straight ahead and 1 mile away. The ship is traveling southeast at 10 m.p.h. Assuming the sub can stop and turn on a dime, and also that the torpedo must be fired parallel to the sub, if the sub can turn 10 degrees per minute and the torpedo travels 40 m.p.h., what is the least angle the sub must turn to hit the ship?

Or if you are on a light diet you can still get an A on your report card by answering this within eight seconds:

A chicken weighs 2 pounds and ¾ of its weight besides.

What is its weight?

Do you need heat treating equipment to fill your government contracts?

If so, here's some real help. "Furnaces for Armament," just off the press, discusses the application of heat treating equipment to practically every one of the major types of contract work being allotted today. A section of the publication is devoted to each of the following: Aircraft Parts, Cartridge Cases, Gun Mounts, Cartridge Clips and Links, Machine Gun Parts, Tools and Dies, Bullet Cores, Tank Parts, etc. All of the information presented is based on *practical* data obtained in installing equipment for the heat treatment of each type of work discussed in the publication. Actual installation photographs are given in all cases. "Furnaces for Armament" shows what equipment is being used, and how it is being used to meet the close specifications called for today. Your copy will be mailed promptly upon request.

LINDBERG ENGINEERING COMPANY
2452 W. HUBBARD STREET, CHICAGO

AT THE METAL SHOW...

Lindberg presents a 12-minute preview of the sound and color movie "Heat Treating Hints" soon to be released. The movie covers the fundamentals of heat treating and will be available for heat treater training and educational purposes. See the preview at the Lindberg Booth in Philadelphia and secure full information as to how to arrange for a showing in your plant, or write.

LINDBERG FURNACES

This Industrial Week . . .

OBSTACLES preventing the full use of many of the nation's steel and metal-working plants this week overshadowed the very substantial efforts being made to increase industrial capacity for national defense.

To many observers it seemed that these obstacles, which include (1) strikes and slowdowns, (2) shortages of iron and steel scrap, and other vital raw materials, and (3) priorities curtailments and shutdowns—all involving the use of existing equipment—were getting relatively less attention from Washington than the subject of industrial expansion. In some defense agency offices the attitude appeared to be: "We can build new plants faster than the boys in the unions can shut them down."

Keep Ahead Of Strikers

The question of building new steel plant capacity, to be producing in from nine to 24 months, reached one of a series of "climaxes" when the Supply Priorities and Allocations Board approved an increase of 10 million tons of ingot capacity in a program which the Office of Production Management hastened to stimulate through requests to federal agencies for financing specific steel plant projects.

Under this SPAB-approved plan, written by W. A. Hauck, OPM consultant, the choice (from a defense viewpoint) projects from expansion programs submitted by more than 30 steel companies, will be selected to a point where the country's steel ingot capacity is increased by 10 million tons to a total of 99 million tons annually. This program, to be financed almost entirely by the government, will throw a tremendous strain on supplies of steel plant equipment, despite the use of highest priority ratings, and will not completely fill defense and civilian needs for steel. An additional 5 million tons of ingot capacity (over and above the first 10 million tons) is advocated by the OPM. By the time any of the additional ingot capacity to be built under the OPM plan is completed, the peak demand for defense steel will have passed, some industrialists believe.

10 Million, Then 5 More

Of more immediate significance than steel capacity to be completed next year or the year after are the priority shutdowns which this week really began to bite into the country's industrial and economic structure. Ford Motor Co. has already started to lay off 20,000 employees of the Rouge plant as a direct result of the curtailment of automobile production ordered primarily to divert steel and other needed materials to defense plants. It is doubtful, according to a Ford official, whether the workers now being laid off can be called back to work until they are needed in defense plants now under construction. So far, no direct defense material or equipment, except quarterton "blitz buggies," is in production in Ford plants in any large quantities.

Ford to Lay-off 20,000

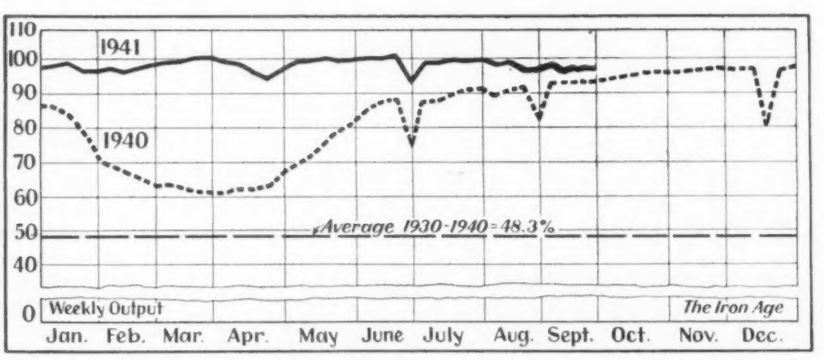
But the Ford layoff is only one. The workings of the priorities system of distributing metals and other materials is expected to result in the layoff of 3000 workers at General Motors' Dayton, Ohio, Frigidaire plant, 700 men at Westinghouse Electric & Mfg. Co.'s Mansfield, Ohio, plant, and 1700 men at GM's Fisher body plant at Cleveland. And in Canada, the government has called for a limiting of stove, refrigerator, washing machine and other consumer goods production to 75 per cent of 1940 totals.

Meanwhile a non-integrated sheet mill in the midwest has suspended production, due to lack of sheet bars and its officers are reported considering liquidation of its business.

Another barrier to all-out industrial production, perhaps in time to be the more dangerous, is the new wave of strikes in defense plants. Carnegie-Illinois Steel Corp.'s large Gary, Ind., plant seemed to be getting back to normalcy after settlement Monday night of an unauthorized strike of crane operators which kept 17,000 workmen idle for two days. The cranemen objected to the release of summer relief operators and by striking gave their own answer to last week's order by the SWOC, to which they belong, that individual members are not to stage strikes which have not first been approved by the heads of the union. Steel lost in the Gary strike is equivalent to that needed in building 41 submarines. American Bridge Co.'s Chicago district plant went down on Friday, Oct. 3, and resumed Monday in another flash strike involving a dues-collecting

Steel Ingot Production—Per Cent of Capacity

(Open Hearth, Bessemer and Electric Ingots)



Steel Ingot Production, by Districts—Per Cent of Capacity

	Pitts-burgh	Chi-cago	Val-leys	Phila-delphia	Cleve-land	Buf-falo	Wheel-ing	De-troit	South-ern	S.Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
Current Week	100.0	93.0	102.0	90.5	98.0	106.0	93.0	107.5	96.5	97.0	97.0	102.0	101.0	98.0
Previous Week	99.0	101.0	100.0	91.5	98.0	104.5	91.0	107.5	96.0	101.0	97.0	102.0	93.0	98.5

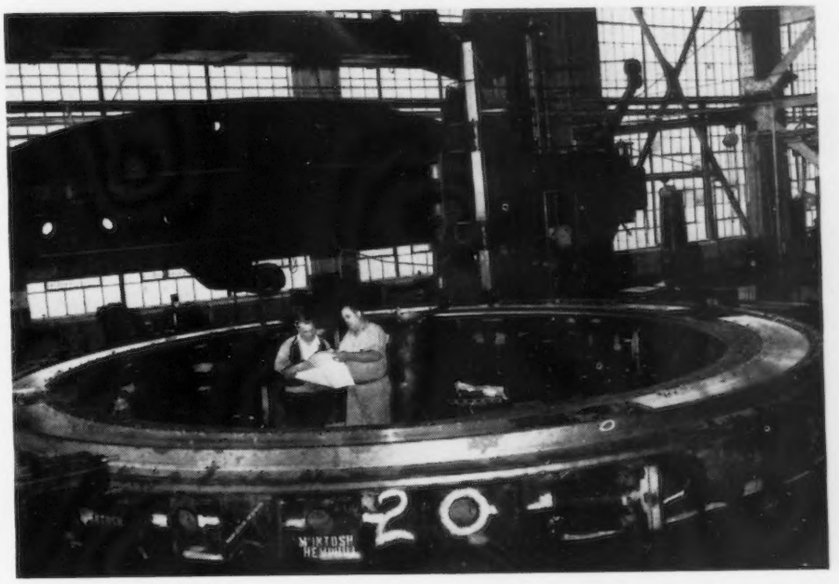
drive and a demand by local SWOC leaders for the dismissal of four non-union workmen. The Wickwire Brothers mill at Cortland, N. Y., was strike-bound early this week for the first time in its history. Five mills of the Niles Rolling Mill Co. at Niles, Ohio, were idle Monday in a strike over restoration of a wage cut.

These and other labor disputes may be the preliminary rounds in an industry-wide showdown in steel on the closed shop and "maintenance of membership" issues raised by union leaders. This major threat to continued high production of material needed for defense may not be near at hand but the attitudes of the groups involved suggest that here is a problem that will be settled before many months have passed.

Closed Shop Fight Coming

Many steel companies continue to remain on the ragged edge as far as scrap supplies are concerned. Should anything interfere with incoming shipments of scrap many steel units would be forced down immediately because of the decline or, in some cases, disappearance of inventories. The scrap trade continues to await the setting-up of a priorities system and is finding it extremely difficult to pick up additional supplies. The first serious shutdown in steel operations because of the scrap shortage may force the government to resort to downright allocation of supplies. On Tuesday Price Administrator Leon Henderson denied that the OPA is considering an increase in the scrap price ceiling, or that his office plans to change or eliminate various grades of scrap covered by the schedule so that higher ceiling prices would result for some grades. "The maximum prices established in the iron and steel scrap schedule are ample to bring out all scrap available," Henderson said. "No increases in the general price level are warranted and none will be made. Those dealers who are hoarding scrap in anticipation of higher prices may find themselves in an uncomfortable situation if their actions continue to hinder the progress of the defense effort."

Henderson's Scrap Warning



DEFENSE RING: This large circular object is a 41 ft. base plate for a 16-in. coast artillery gun. It is made of four quadrant castings bolted together and is shown after the bearing surface has been faced off in a big boring mill at the Watertown, Mass., arsenal, one of the few plants in the country that has equipment of sufficient capacity for work of this kind.

Since several steel plants were forced to curtail operations, due to lack of scrap and because of the Gary strike, the national rate of steel production has dropped a half point to 98 per cent from 98.5 per cent last week. Pittsburgh district operations rose one point to 100 per cent and the Valleys (Youngstown) gained two points to 102 per cent. Chicago dropped 8 points to 93 per cent.

Meanwhile, the volume of steel specifications in the past week has again turned upward and steel companies in some instances are booking orders for 10 to 25 per cent more steel than they are producing or shipping. Consequently steel backlogs are again increasing and, in view of the obstacles to higher production, are likely to remain at record levels for some time to come. The share of steel plant schedules monopolized for national defense is steadily increasing. Washington continues to allocate shipments of various types of steel for lease-lend countries. Russia is understood to have placed orders for sheet steel.

Production of coke pig iron in September, according to an IRON AGE survey, totaled 4,716,901 net tons, compared with 4,791,432 tons in August. Output on a daily basis last month showed a gain of one per cent over that in August, or from 154,562 tons to 157,230 tons. The operating rate for this industry was 98.8 per cent of capacity in September, compared with 97.5 per cent in August. On Oct. 1, there were 216 furnaces in blast, compared with 213 in blast on Sept. 1.

Iron Output at 98.8 per cent.

Fabricated structural steel awards of 8400 tons are the lowest for any week this year, the only lettings of size being 3000 tons at South Boston, Mass., for a Navy Yard dock building, and 1000 tons for a Los Angeles River bridge at Los Angeles. New structural steel projects dropped to 9200 tons from 21,725 tons last week, the largest inquiry being 2000 tons for a highway bridge at Fayette, Ky., and 1550 tons at Centerline, Mich., for an extension to the Chrysler tank arsenal.

Reinforcing steel awards of 11,855 tons compare with 38,125 tons last week, with the largest contracts being 3200 tons for a sewer project in the Borough of Queens, New York, and 2200 tons at Seattle for an Army Quartermaster Corps pier.

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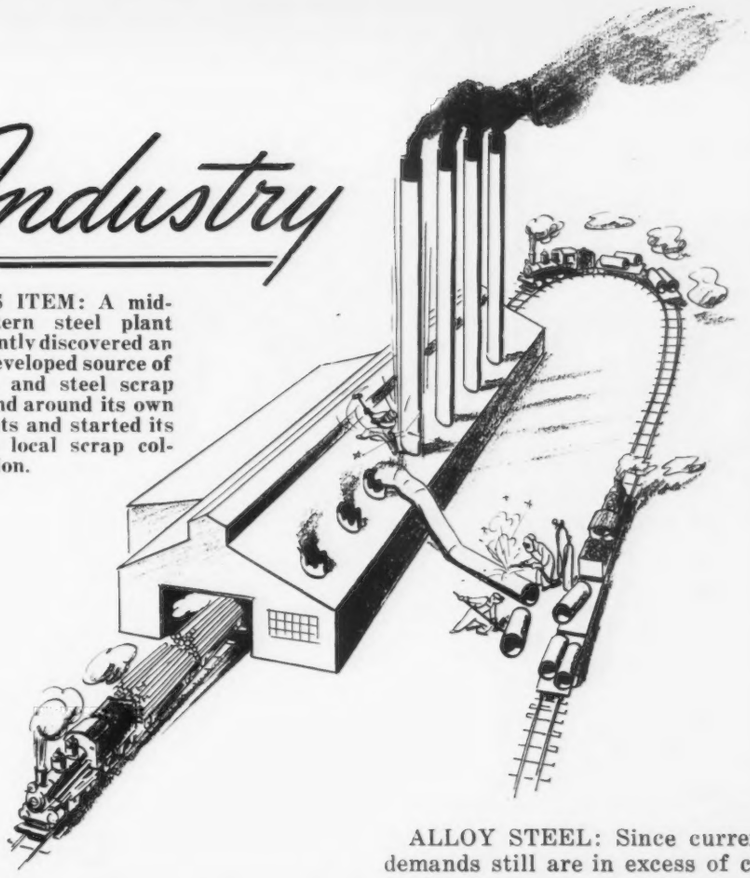
News of Industry



NEWS ITEM: A mid-western steel plant recently discovered an undeveloped source of iron and steel scrap in and around its own plants and started its own local scrap collection.

OPM Requests Funds For 10-Million Ton Expansion of Steel

• • • **Requests to federal** agencies for financing specific steel plant projects under the 10-million-ton expansion program approved last week by the Supply Priorities and Allocations Board were being prepared this week by OPM officials.

The 10-million-ton expansion, which will lift the nation's steel capacity to 99 million tons, will cost $1,250,000,000 and, according to W. A. Hauck, OPM steel consultant who submitted this latest steel plant building report, will be completed in from nine months to two years.

The program, to be financed almost entirely by the government as a defense measure, will throw a tremendous strain on the suppliers of steel plant equipment, even with the use of the highest priority ratings, and will not completely fill defense and civilian needs for steel, Mr. Hauck declares. Since the 10-million-ton expansion barely covers the additional capacity required for needed specific expansion projects, installation of another 5 million tons was proposed in the Hauck report.

In his report, the latest development in the controversy between all-out expansionists of steel capacity and others, including most steel producers, who fear the post-war consequences of such a great steel plant building program and doubt its need now, were the names of 30 steel companies which have offered programs expanding ingot output by 13,118,768 tons. Nearly all the large steel manufacturers and many small producers were on this list. U. S. Steel Corp. subsidiaries have offered to build 3,366,060 net tons of ingot capacity, Bethlehem Steel Co. 2,772,000 tons, and Republic Steel Corp. 1,450,000 tons, with other programs ranging down to 9000 tons for a plant at New Castle, Ind.

No hope for quick relief of civilian industries suffering from lack of steel could be found in this latest steel expansion program, which will itself consume 2,250,000 tons of "seed corn" steel, or 1.3 per cent of capacity each year to build itself.

How at least part of the steel industry views this newest capacity expansion was shown in a statement by Walter S. Tower, American Iron and Steel Institute president, that "the proposed 10-million-ton expansion may come too late to have any value in the present problem, since the peak of the defense demands for steel will probably be reached in 1942, or at latest in early 1943.

"The steel industry in 1942," Mr. Tower said, "will make tens of millions of tons above the maximum of all defense or war needs. Of the 10-million-ton program, it is extremely doubtful whether any measurable effect could be expected before the end of 1944, if then, because of the physical limitations imposed by the steps necessary to get supplies of metallics and ore-carrying facilities."

Scrap, pig iron, ore-carrying vessels and other factors were discussed in Mr. Hauck's recommendations, which included the following specific examples of expansion:

ALLOY STEEL: Since current demands still are in excess of capacity, a program providing for at least 1,000,000 tons of additional alloy steel capacity is being undertaken.

BESSEMER STEEL: Because a serious scrap shortage "is anticipated for the duration of the emergency," because bessemer steel requires a minimum of scrap and can be made more quickly, and because bessemer steel facilities can be used for making synthetic scrap, a program providing at least 1,000,000 tons of bessemer capacity, with balanced finishing facilities, is being developed.

ROLLED ARMOR: Armament production requires certain kinds of steel and types of facilities not used in normal times. A year ago capacity for rolled armor was at a minimum. Additional heavy demands have recently arisen due to increases in the tank program, hence a program for at least 100,000 tons of steel capacity for rolled armor, with balanced facilities, is underway.

PLATES: Present demand is at the rate of 8,500,000 to 9,000,000 tons a year and production is at the rate of 6,300,000 tons. Since this deficiency is likely to increase, particularly when the Maritime Commission ship program reaches its peak in the third period of 1942, a total of 2,336,920 tons of additional plate capacity has been approved. This includes 654,000 tons from revamping strip

PROPOSED INCREASES IN NATION'S STEEL PLANT CAPACITY

COST: $1,250,000,000, most of which will be government-financed

TIME TO COMPLETE: From 9 to 24 months with highest priority ratings

AMOUNT: 13,118,768 tons of ingots, divided among 30 companies

SOURCE: Report By W. A. Hauck OPM, Sept. 24, on Expansion

Name of Company	Proposed Steel Ingot Capacity Increase	By Expanding Present Plants	By Constructing New Plants	Finished Steel Needed For Expansions	Present Steel Ingot Capacity	Increase in Pig Iron Capacity	Increase in Electric Furnace Steelt	Increase in Plate Capacity On Plate Mills	Increase in Plate Capacity On Strip Mills
American Rolling Mill Co.	384,240	384,240	.....	.....	2,885,000*	.....	.....	.....	.....
Apollo Steel Co.	241,920	241,920	.....	.....	.....	.....	.....	.....	.....
Bethlehem Steel Co.	2,772,000	2,064,000	708,000	350,000	12,112,000	1,692,000	60,000	780,000	.....
*Carnegie-Illinois Steel Corp.	.....	.....	.....	.....	.....	.....	.....	760,000	.....
Central Iron & Steel Co.	41,400	41,400	.....	.....	300,000	.....	.....	.....	.....
Colorado Fuel & Iron Co.	250,000	250,000	.....	53,300	1,131,000	274,400	.....	.....	.....
*Columbia Steel Co.	.....	.....	.....	.....	.....	.....	.....	411,150	.....
Continental Steel Corp.	30,000	.....	30,000	.....	364,000	.....	7,200	.....	.....
Copperweld Steel Co.	66,000	.....	66,000	.....	172,000	.....	.....	.....	.....
Empire Sheet & Tin Plate Co.	151,200	151,200	.....	.....	378,000	.....	.....	.....	.....
Ford Motor Co.	178,800	178,800	.....	.....	941,000	.....	.....	.....	.....
Granite City Steel Co.	500,000	500,000	.....	25,000	403,000	.....	.....	.....	100,000
**Great Lakes Steel Corp.	.....	.....	.....	.....	.....	.....	.....	.....	276,000
Henry Disston & Sons Co.	18,000	18,000	.....	.....	19,000	.....	.....	.....	.....
Inland Steel Co.	720,000	.....	720,000	.....	3,350,000	720,000	.....	240,000	.....
Ingersoll Steel & Disc Co.	9,600	9,600	.....	.....	15,000	.....	.....	.....	.....
Jones & Laughlin Steel Corp.	976,200	976,200	.....	81,095	3,944,000	.....	.....	.....	.....
Laclede Steel Co.	78,400	78,400	.....	450	283,000	.....	.....	.....	.....
Lukens Steel Co.	350,000	350,000	.....	.....	714,000	.....	.....	.....	.....
National Steel Corp.	250,000	250,000	.....	.....	3,580,000	.....	.....	.....	.....
Northwestern Steel & Wire Co.	50,000	50,000	.....	220	202,000	.....	.....	.....	.....
Northwest Steel Rolling Mills	32,000	32,000	.....	1,275	8,000	.....	32,000	.....	.....
Oregon Elect. Steel Roll. Mills	60,000	.....	60,000	.....	.....	.....	60,000	.....	.....
Otis Steel Co.	218,000	218,000	.....	.....	977,000	.....	.....	240,000	.....
Pacific States Steel Co.	84,000	84,000	.....	.....	20,000	.....	84,000	.....	.....
Phoenix Iron Co.	50,000	50,000	.....	600	246,000	.....	.....	.....	.....
Pittsburgh Steel Co.	248,000	248,000	.....	.....	1,072,000	.....	.....	.....	.....
Republic Steel Corp.	1,450,000	1,450,000	.....	85,000	8,325,000	1,391,000	.....	.....	204,000
Sheffield Steel Co. (Texas)	222,948	.....	222,948	12,958	.....	.....	.....	200,000	.....
Sheffield Steel Co. (Kansas City)	56,000	56,000	.....	.....	626,000	.....	.....	.....	.....
Texas Steel Co.	20,000	20,000	.....	.....	9,000	.....	.....	.....	.....
U. S. Steel Corp.	3,366,060	429,100	2,936,960	300,960	30,109,000	2,431,550	.....	.....	.....
*Tennessee Coal, I. & R. Co.	.....	.....	.....	.....	.....	.....	.....	142,920	.....
Wheeling Steel Corp.	100,000	100,000	.....	.....	1,960,000	.....	.....	.....	.....
Youngstown Sheet & Tube Co.	144,000	144,000	.....	.....	.....	.....	.....	.....	174,000
TOTALS	13,118,768	8,374,860	4,743,908	910,858	74,145,000	6,508,950	.....	2,774,070	754,000

NOTE: The above totals, in net tons, include steel ingot capacity of 462,000 tons financed by the steel companies themselves, 84,000 tons financed by the Navy Department, 2,315,200 tons in projects already approved or under way, allowance of 5,465,300 tons for expansion for specific purposes, and an unallocated increase in ingot capacity of 1,673,500 tons.

Additional expansion programs will be filed by steel companies with the OPM, which by Oct. 3 was requesting federal financing for specific projects on the above list. The 10-million-ton steel expansion urged by Mr. Hauck would lift U.S. ingot capacity to about 99,000,000 tons. An additional 5 million tons he proposes, but which has not yet been approved by SPAB, would lift it to 104 million tons a year. Some small companies submitting projects were not listed in the Hauck report (issued Sept. 24, 1941), which also omitted names of communities where the above expansions are proposed.

*Ingot expansions included in total for U. S. Steel Corp. **Ingot expansions included in total for National Steel Corp.

† A complete list of all electric and bessemer projects are not yet available. This phase of the expansion is being studied project by project and a breakdown will not be available for some time.

mills, 142,920 tons of new capacity by Tennessee Coal, Iron & Railroad Co., 780,000 tons by Bethlehem Steel Co. and 760,000 tons by Carnegie-Illinois Steel Corp.

WEST COAST: For strategic reasons, which make it necessary to make this area substantially independent of eastern mills, ingot capacity will be expanded by 1,865,300 net tons, including 708,000 tons by Bethlehem Steel, 981,300 tons by Columbia Steel Co., a U. S. Steel Corp. subsidiary, 84,000 by Pacific States Steel Co., 32,000 by Northwest Steel Rolling Mills, and 60,000 by Oregon Electric Steel Rolling Mills, Inc.

Bethlehem's proposed new plant at Los Angeles will include two blast furnaces, coke ovens, openhearth plant, alloy steel plant, one 46-in. roughing mill, one combination 36-in.-28-in. billet rail and structural mill, one 14-in.-16-in. bar and structural mill, one 12-in. bar mill and auxiliary and service departments. Products will include structural shapes, sheet piling, rails, splice bars, tie plates, shell steel, openhearth carbon and alloy bars and electric alloy bars.

Columbia Steel's new plants at Provo, Utah, will include three blast furnaces and coke ovens with an annual capacity of 1,004,150 tons of pig iron. Columbia's facilities at Pittsburg, Cal., will include an openhearth plant, blooming and slabbing mill, sheet bar mill, sheet mills, 110-in. plate mill, and a steel foundry. Products will include plates, sheets and steel castings.

PROJECTS ALREADY APPROVED: Of the 10 million tons of ingot capacity now planned, 2,861,200 tons have already been approved. This includes new capacity totaling 2,315,200 tons at Homestead, Duquesne and Braddock, Pa., and Sparrows Point, Md.

KAISER'S PROJECT: A proposal by Henry J. Kaiser & Associates, of Oakland, Cal., for building blast furnaces in Utah, a steel plant in Los Angeles and electric furnaces in the Bonneville, Ore., district, has not yet been given final consideration.

Additional proposals pushing the total of steel ingot capacity above the 10,000,000 tons approved by SPAB and beyond the additional 5,000,000 tons recommended by Mr. Hauck are still to come from the steel companies.

Obstacles Great to Steel Expansion

Pittsburgh

• • • **While the public** and the nation's press for the most part are intrigued by the possible increase in the country's steel ingot facilities, tucked away in the OPM report on the steel expansion program, under the heading of "Difficulties Confronting Expansion," are three items which observers here believe hold the key to the success or failure in obtaining such ingot expansion in time to contribute to the national emergency. These are — securing adequate supplies for raw materials, lack of ships for transporting iron ore over the Great Lakes, and an inadequate supply of scrap.

80% of Expansion In Eastern States

• • • While the largest relative increase in steel ingot capacity, with respect to existing capacity, as proposed in the OPM report on steel expansion, will take place on the west coast for "economic and strategic reasons," more than 80 per cent of the proposed 13,118,768-ton increase will be in plants located east of the Rocky Mountains. A geographical breakdown of the proposed increase is given below. This listing covers only steel ingots. Other west coast expansion programs cover new capacity for producing castings, forgings, pig iron and finished steel products.

CAPACITY INCREASES BY STATES

West of Rocky Mountains	Net Tons of Ingots	
California	1,725,300	
Oregon	60,000	
Washington	80,000	
Total		1,865,300
Colorado	250,000	
Texas	242,948	
		492,948
East of Rocky Mountains		
Alabama	300,000	
Illinois	50,000	
Indiana	1,153,200	
Kentucky	144,240	
Maryland	300,000	
Michigan	428,800	
Missouri	578,400	
New York	600,000	
Ohio	1,925,200	
Oklahoma	56,000	
Pennsylvania	5,224,680	
		10,760,520
Total, All States		13,118,768

Until an adequate supply of raw materials in the form of ore, coke, and scrap are definitely provided for, it is believed here that large scale embarkation on construction projects for open hearth and bessemer steel plants and even blast furnaces is pretty much beside the point. On paper the provision for raw materials may seem relatively simple but obstacles now in the picture are such that the question becomes more complex as it is analyzed, according to some opinion here.

Aside from the 10,000,000 tons of ingot expansion mentioned in the OPM report, it is recalled that the steel industry has already under way the installation of approximately 3,000,000 additional annual tons of steel ingots which will raise the country's capacity early in 1942 to 89,000,000 tons.

With the growing scrap shortage and maximum steel operations, pig iron capacity earlier this year was a retarding factor in the production of steel ingots to the fullest extent of existing equipment. Even though provision has already been made for the construction of approximately 6,500,000 tons of pig iron capacity, it is believed here that most of this, when completed, will furnish little or no support to the 10,000,000 tons of steel ingot capacity now in the expansion program and approved by SPAB. Likewise, the provision for the construction of 25 additional ore carrying vessels will, if anything, do no more than protect existing or soon to be installed steel capacity. Furthermore, it is argued here that the scrap shortage will become far more serious than is generally supposed, hence a greater proportion of pig iron capacity now under construction will have to be utilized to make up for the actual deficiency in scrap supplies.

With serious difficulties already facing the carrying out of the ore boat and blast furnace program to protect current capacity, some observers have come to the realistic conclusion that raw material provisions for the specific 10,000,000-ton ingot expansion program will be so difficult to provide for that completion of the steel expansion program may not be anywhere near the period of time now being mentioned.

THIS WEEK'S

Priorities and Prices

Lead, including imported and domestic metal, placed under full priority control in order M-38 issued Oct. 4. (OPM-PM1302)

Jobbers, warehouses and small distributors of certain merchant steel products aided by new plan of shipments under order M-21-b. Definite quotas are established for such shipments. (OPM-PM1272)

All iron and steel products sold through jobbers, dealers and distributors to be brought under a price ceiling in near future to prevent "profiteering." (OPA-PM1305)

Aluminum scrap and secondary ingot prices to be reduced Nov. 1 to reflect recent reduction of 2c. a lb. in primary aluminum quotations. (OPA-PM1280)

Form PD-1, used in requests for priority ratings, may be reproduced, but exact phraseology, size, etc., of official blanks must be followed. (OPM-PM1287)

Manufacturers, wholesalers and retailers dealing in articles subject to new Federal excise taxes asked to avoid pyramiding of the taxes. It should be left out of all mark-up calculations, it was officially stated. (OPA-PM1284)

Flying squadron of 50 engineers developed to examine possibilities of converting communities threatened with priorities unemployment into defense production. (OPM-PM1285)

Steel expansion program involving an increase in present capacity of 10,000,000 tons proposed by SPAB. (OPM-PM1286)

Paperboard price ceiling for all material sold East of the Rocky Mountains established in Schedule No. 32. Schedule, effective Oct. 1, supplants voluntary schedule previously in effect. (OPA-PM1283)

Copper scrap placed under full priority control in supplementary order M-9-b issued Sept. 30. (OPA-PM1270)

Gasoline deliveries cut 10 per cent for October in new limitation order. Replaces similar order for September by the former OPACS. (OPM-PM1281)

Ford PD-73 group classifications revised and clarified. New descriptions replace those previously printed on back side of OPM Form PD-73.

Scrap rubber prices should not be increased, according to an official statement. No justification for an advance exists, it was stated. (OPA-PM1311)

Fire-fighting equipment manufacturers asked to reduce use of critical materials. Limitations set on types of equipment which may be made and unnecessary trimmings are to be eliminated. (OPM-PM1310)

Methanol (wood alcohol) placed under a price ceiling is Schedule No. 34, which sets 60c. a gallon East of Mississippi River, and 63c. West of the Mississippi (OPA-PM1308)

Steel scrap price ceiling will not be raised, according to an official statement. Present prices are adequate, it was asserted.

Southern pine producers refused request for an increase of $2 a 1000 board feet. (OPA-PM1304)

Brass mill scrap price schedule subjected to several minor changes, including listing of "copper" and "nickel silver" grades. (OPA-PM1290)

Repair and supplies order P-46, covering utilities, subjected to several interpretations. (OPM-PM1271 and PM1297)

★ ★ ★

For copies of above announcements address defense agency concerned, at Washington, giving announcement number as shown in brackets after each paragraph (OPM-PM1300 means announcement 1300 issued by Office of Production Management.)

New Instructions On Use of PD-73 Are Issued by OPM

• • • **Further instructions** covering proper group classifications for Form PD-73 have been issued by OPM for the assistance of producers and purchasers of steel, some of whom have been hampered by the very brief group definitions printed on the back of PD-73.

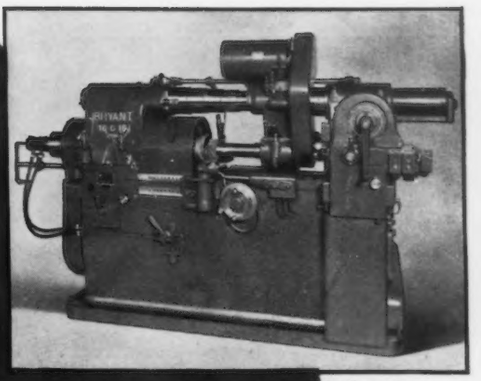
In Groups A, B and C (which are, respectively, Army-Navy; Maritime-U. S. Agencies; and lend-lease groups) orders received by a steel producer directly from the government agencies or foreign countries mentioned in these groups on Form PD-73 are to be classified in these groups regardless of whether accompanied by preference rating certificates.

Orders received from a civilian customer and accompanied by a preference rating certificate Form PD-3, properly extended, belong in Group A; while orders for products received from a civilian customer and accompanied by certificate Form PD-4, properly extended, belong in Group B. Orders from civilians accompanied by a preference rating certificate, properly extended and identified by DA symbol, belong in Group C.

If a civilian customer's order, accompanied by PD-73, properly executed, and statement on that form that his product will be for the Army or Navy and sends a photostat copy of his "A-N" order, then the order may be put in Group A with a rating of A-10. Otherwise the order goes in Group H with no preference rating. The same rule is laid down for both Group B and Group C classifications.

Instructions for the other groups include the following:

Group D — Priorities — If assigned a rating of A-10 or higher by OPM, orders from civilian customers belong in this group. Orders covered by certificates PD-2 or blanket ratings issued by OPM when such certificates or blanket ratings have been properly extended and carry an A-10 or higher preference rating belong in this group.

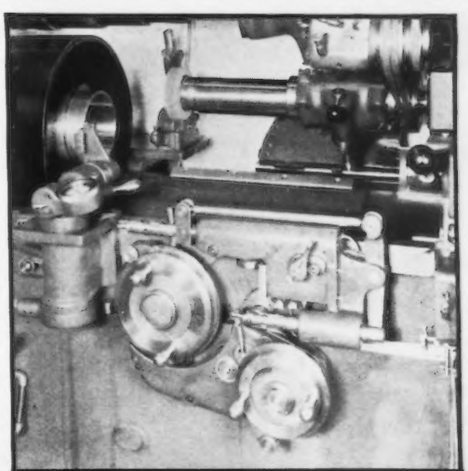


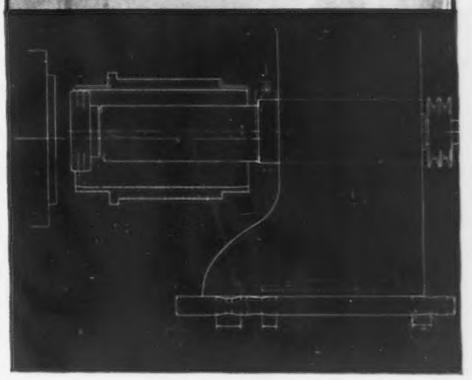
Bryant 16-C-16 Internal Grinder

MONEY IN THE BANK

WHEN PARTS ARE GROUND ON BRYANT GRINDERS

You'll be money ahead if Bryant Hydraulic Internal Grinders are used for grinding all the holes and faces on your parts. These time-saving, cost-saving grinders are "just what the doctor ordered" for both commercial and defense needs. Pictured here is a Bryant 16-C-16 used for grinding the bore of aircraft engine cylinders. The line drawing shows how the control bar guides the wheel in the cylinder so that straight and curved portions may be ground in one handling — with absolute accuracy — fine finish — and at low cost per piece.





Whether you're watching every minute on defense work or watching every penny on peacetime products, it will pay to investigate the Bryant line of Internal Grinders. Put in a Bryant and put money in the bank.

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U.S.A.

Rising Wages Prove Threat to Southern Industrial Gains

By HERMAN KLEIN

Nashville, Tenn.

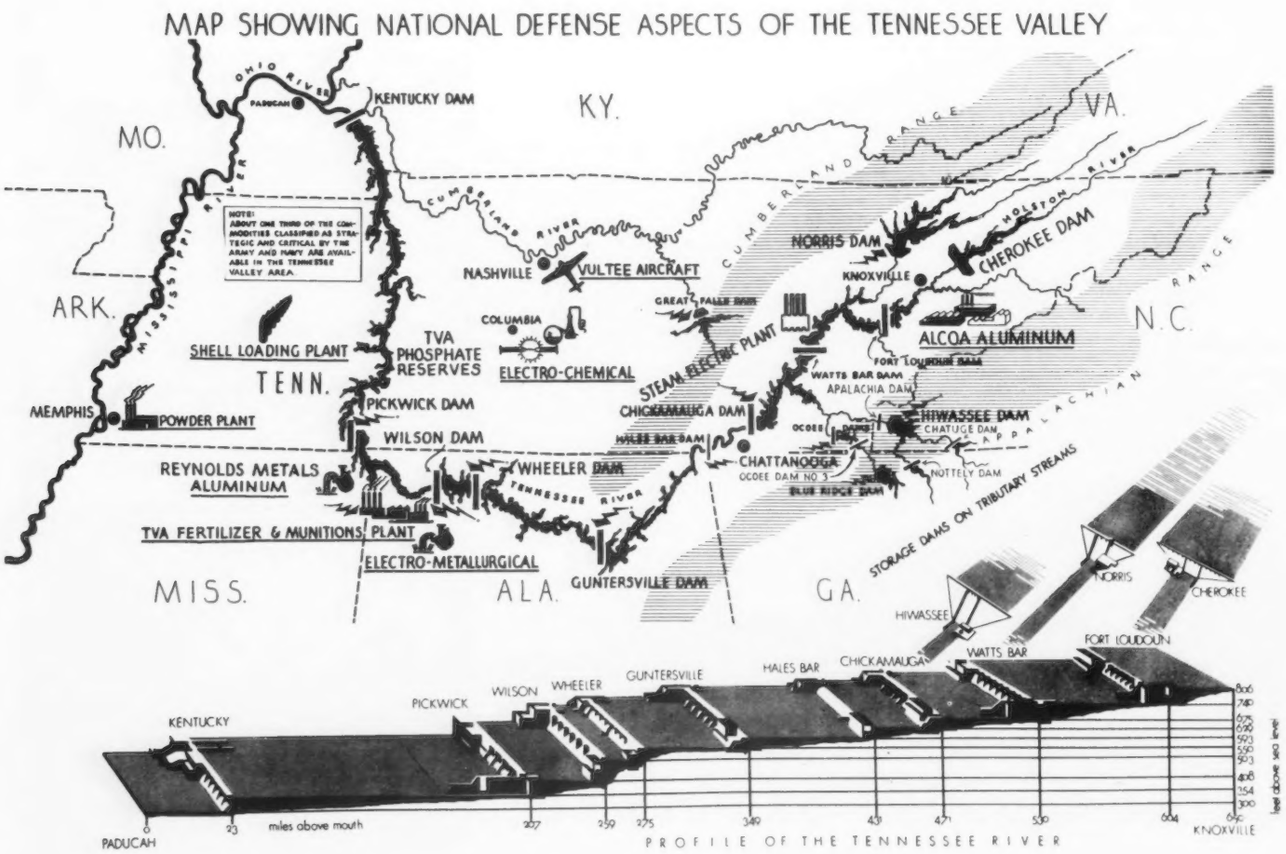
• • • **Amid considerable** pomp, the citizens of this city on May 4, 1941, helped dedicate the new plant of Vultee Aircraft, Inc. In a special edition heralding the occasion, a newspaper predicted: "The 'inner citadel' (Tennessee) in times of war, may be seen as the nation's new production center in times of peace . . . balanced on a sturdy tripod of rich natural resources, decentralized industry and obvious advantages of distribution. It is not surprising that . . . the people of Nashville . . . invite the future with complete felicity."

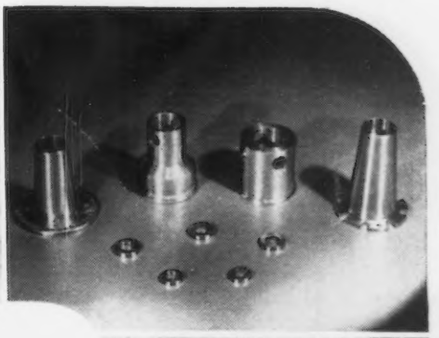
Unfortunately, for Tennessee and the South, these blithe notes sound a hollow ring. For Southern industry's ancient life-saver—wage differential—is on its way out. If it continues to fade, it may take with it whatever hope the South holds for a place in the industrial spotlight of the future.

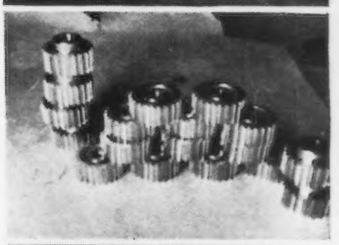
Stemming from the birth of TVA and bolstered by the impetus of the defense program, talk of the South becoming an important industrial center has been heard more and more frequently. Selecting Tennessee because it has more representative metal working plants and is closer to the East and middle West, THE IRON AGE found trends disturbing to those hoping for pronounced industrial growth. Already, this same Vultee plant has discovered that its payroll approximates the level at its other plants.

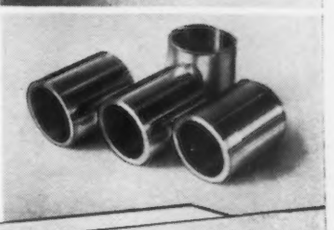
Wage increases have removed the section's only counter irritant to higher freight rates. A small steel stampings manufacturer unable to get material for regular work told THE IRON AGE he couldn't land a defense sub-contract in the midwest, the closest section where such business is available, because labor and freight costs threw his costs above those of firms located nearer the prime contractors. A small steel mill was in the throes of a strike for higher wages when THE IRON AGE called. Management indicated it might be forced to keep the mill down since it could not meet the wage demands and stay in business. This same plant said it had lost welders and electricians at 80c. an hour to the TVA, who offered almost 50 per cent more.

Manufacturers reason that unless they continue to hold some economic lever of adjustment, they will be forced to restrict operations to their own sector. They point out that the South has 20 per cent of the nation's population, and only about 11 per cent of its purchasing power. Industrialists do not resist higher payrolls for the reasons the "social-conscious leaders" in Washington have implied to them. Their argument is that Southern production per man per hour is lower; living costs are lower; costs of doing business are higher. Q.E.D.: they









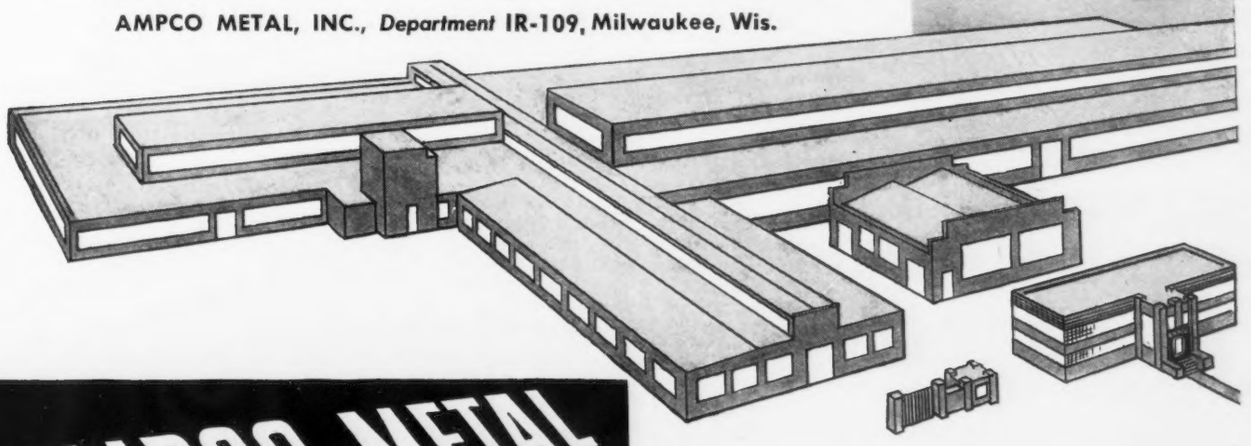
In the Tools and Weapons of Defense

Like hundreds of other plants, the Ampco foundries are all out for defense. Today 98.5% of the output is devoted to defense activities. Ampco Metal and Ampco-made bronzes are being used in aircraft, machine tools, ordnance, and other equipment where the sturdy, wear-resistant qualities of Ampco alloys are essential.

For years before the defense program was under way, Ampco was serving American industries, helping build the quality for which American products are famous. The high tensile strength, controlled hardness, and resistance to wear and corrosion of Ampco-made bronzes were early recognized by designing engineers as necessary for satisfactory equipment performance.

Catalog number 22—brand new—shows why Ampco Metal is preferred by defense contractors.

AMPCO METAL, INC., *Department* IR-109, Milwaukee, Wis.



AMPCO METAL

The Metal Without An Equal

AMPCO

AMPCO FOUNDRIES—plant capacity has been doubled, making this the largest foundry in the country devoted primarily to the production of aluminum bronzes of controlled analyses.

must have some cost advantage to remain the mild competitors they have been.

Naturally, the Tennessee Valley Authority is at the crux of any discussion of Tennessee or the South, today. It has reduced power rates by 40 per cent, increased consumption per k.w.h. per customer to almost double the U. S. average. It is furnishing considerable power to industry. But many businessmen say that is only because it has been forced to do so because of defense.

Besides its dominant goals of flood control, cheaper power, all-year navigation, TVA's defense charges: are reconditioning of the ammonium nitrate plant at Muscle Shoals on which it has spent $6,500,000; increased production of concentrated phosphates fertilizers, $1,000,000 having been spent so far; improved navigation by development of a 9-ft. channel from the Ohio River to Knoxville, through its multi-purpose dams (so far 464 mi. are complete to Chattanooga); construction and managing of 250 unit housing project for defense workers at Muscle Shoals; research on critical defense materials; naturally, provision of power to defense industries; and under the TVA act, the use of any of its properties when needed for defense purposes.

Although this section alone has one-third of the critical raw materials for defense, and though the South is truly rich in natural resources, it is deficient in many industries. Among these are pumps and equipment, electrical appliances such as washing machines, refrigerators, etc.; motor vehicles and parts; tractors, paints and varnishes. There is little strong indication of filling any of these holes.

In figures released from Washington Sept. 4, this year, Georgia led all Southern states with only 84 firms holding defense contracts. North Carolina was second with 70, followed by Alabama with 66, South Carolina with 55 and Tennessee with 52. This compares with 876 in New York and 588 in Illinois.

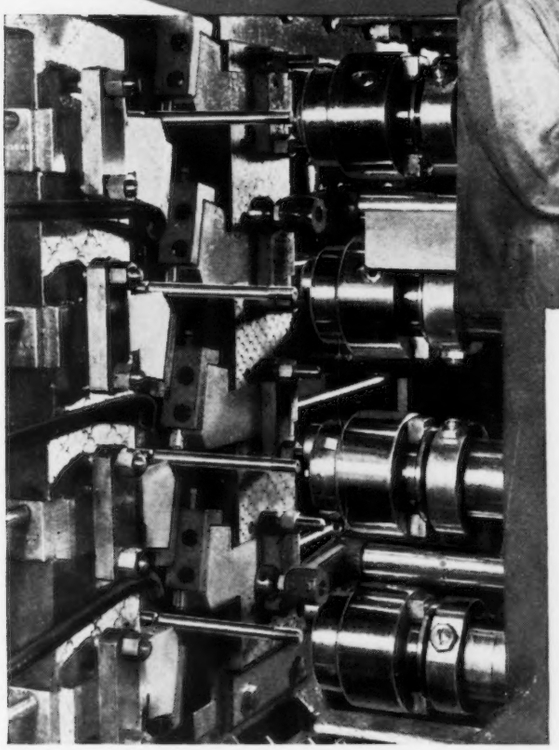
As for Southern labor, it has compiled a record of good behavior. Unionism is growing rapidly and its efforts naturally have pushed along the rising wage scales. For example, union wages in Memphis today for bricklayers are $1.62; machinists $1.00; steamfitters $1.50; in Knoxville structural steel workers get $1.37½; sheet metal workers 80c.; and common labor 40c. Wages in metalworking since the start of the year have risen about 20 per cent.

Current conditions in the four major centers of Tennessee, as reported by THE IRON AGE, show the following:

KNOXVILLE—Has roughly $10,000,000 in prime and sub defense contracts. One of the largest for artillery components and heat control units is held by the Fulton-Sylphon Co. Knox Stove Works is making cast iron griddles. Knoxville Iron Works, the only rolling mill in Tennessee, makes structural shapes, sheared plates, hot rolled strip and bars. Remainder of de-

Another CONE first!

With a NEW MEANS for threading 4 PIECES AT A TIME from bar stock

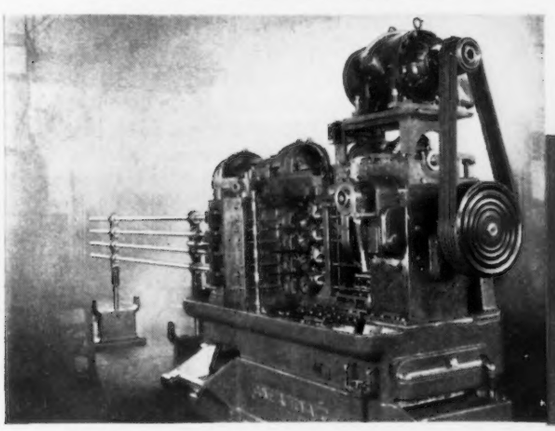


The above is a close-up view of the working area of the 1" CONE Vertical Machine pictured below.

The illustration at the left shows four Tension Bolts, each 5¼" long and 7/16" in diameter, just as the four Die-Heads have withdrawn from the threaded ends. Having already been chamfered, the pieces are about to be severed from the bar stock.

These four pieces are automatically and simultaneously produced in twelve seconds, a time of THREE SECONDS each.

Never was production time more valuable than at present! You owe it to yourself to investigate all CONE time-saving facilities. There is no obligation. Write today!



CONE AUTOMATIC MACHINE CO.
WINDSOR, VERMONT, U.S.A.

fense work is divided into textiles. Strikes have been more frequent the past few months as unionization mounts. Only 14 miles away is the vast Aluminum Co. of America plant at Alcoa. Present expansion will bring total employment to 12,000 and capacity to 164,512,530 lb.

MEMPHIS—Twenty new types of business came into this distributing city during 1940, but the metal working industry is very small. Fisher Aircraft division here is producing wings and fuselages. Short distance away at Milan, is the huge shell loading plant operated by Procter & Gamble. At nearby Millington is the Tennessee Powder Co. plant of du Pont.

NASHVILLE—Originally slated to employ 7400, Vultee as yet is not quite up to 3000, has experienced considerable trouble hitting production. Nashville Bridge Co. is turning out barges, is enlarging facilities for its minesweeper order of almost $1,500,000. Tennessee Products Corp. is refurbishing its plant and reconditioning a blast furnace at Rockwood, Tenn., for production of ferro-manganese. All told, Nashville has about $10,000,000 in prime defense contracts, one-fifth of this in sub-contracts, the majority in shoes and textiles. A host of scattered metal job shops are facing the materials pinch, and can't get subcontracts because of higher freight rates. Here they figure steel costs them, on an average, $10 a ton over plants located in the East, Midwest or nearer Birmingham.

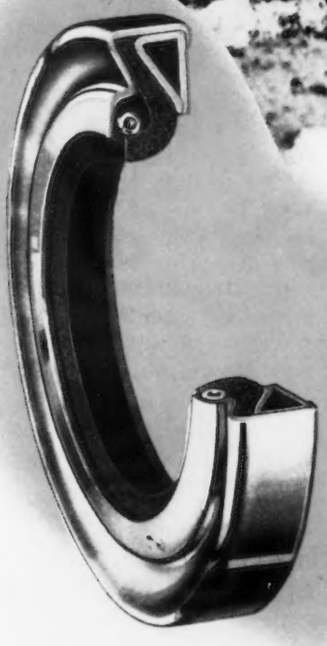
CHATTANOOGA — More metal working is concentrated here than elsewhere in the entire state. Besides well diversified metal plants, there are close to 10 foundries and over $75,000,000 defense contracts. American Lava Corp. has airplane parts. Atlas Powder Co. makes spotting charges. Chattanooga Stamping & Enameling Co. produces mines. Columbian Iron Works has shell casings, has let sub-contracts to International Harvester plant here. Lucy Boiler Mfg. Co. is devoting 50 per cent of production to defense. Also shells and artillery components at the Wheland Co. Combustion Engineering is largely devoted to defense. Street Bros. are making gun carriages. However, few plants are working over 50 hours weekly; few are giving 100 per cent of output to defense. A $39,000,000 Volunteer Ordnance Works for TNT production is going up on the outskirts.

Industry in South Seen Hit by High Wages

Nashville, Tenn.

• • • The defense program's impetus to higher wages, if maintained in the future, bodes ill for not only prospective but also established Southern industry, according to prominent Southern industrialists interviewed by THE IRON AGE. This adverse influence can be counteracted, they believe, only by granting to Southern industry other economic advantages which will compensate for the dislocated wage scales.

ARMY TRUCKS NEED THIS PROTECTION



Right now, MILPACO OIL SEALS are in the army. They are giving thousands of army truck bearings the best possible bearing protection. They are defending them against grit, moisture and lubricant leakage.

A vital part of our national safety is dependable machinery and equipment. And adequate Bearing Protection is a vital factor in every kind of mechanism. MILPACO OIL SEALS have certain characteristics and points of design which result in more effective BEARING PROTECTION and full protection over longer periods of use.

Be sure to investigate MILPACO OIL SEALS for BETTER BEARING PROTECTION on the machinery and equipment you build. Have a MILPACO engineer come in to see you and explain the kind of PROTECTION MILPACO OIL SEALS provide.

MICHIGAN LEATHER PACKING CO.
6315 EAST LAFAYETTE AVE. • DETROIT, MICH.

MILPACO OIL SEALS

Nearby are the chemical plants of Monsanto and Victor Chemical Co. for making phosphates and fertilizer ingredients. There are 6 prime and 30 sub-contractors here sharing $19,000,000 in prime metal defense contracts and $12,000,000 in sub-contracts. The sub-contracting is mostly in castings, stampings, shell forgings, machining, storage and boiler tanks. More highly unionized than any other city, wages here have gone up 20 per cent or more this year.

Aside from the small towns of Milan, Millington, Columbia, where big defense projects have been created, and Tullahoma, seat of the giant Army training center, Camp Forrest, 18 other Tennessee communities have obtained defense work, almost entirely in textiles.

Generally, the TVA and defense program show little indication at this point of bringing large scale permanent industrial gains to the South. In fact, the Southern Railway commenting in its annual report for 1940 on such industrial expansion as has occurred, warned ". . . improved industrial activity is the result of the National Defense Program . . . the continuance of which over any extended period of time may not reasonably be expected."

Home Construction Project Launched by Gary Unions

Gary, Ind.

• • • **Labor unions** here are prepared to go into the business of private home construction. Lake County Industrial Union Council and its affiliated 22 CIO organizations state ground will be broken for a subdivision known as "Victory Homes" before the end of September. About 2025 homes, costing $4100 each, will be constructed to serve Gary, Hammond, Chesterton and Michigan City. Union organizations are working out their plan under FHA.

↓ ↓

Muscle Shoals, Ala.

• • • **To meet** defense workers' housing needs, TVA is erecting 150 demountable houses in this area. Demountable units were picked because they can be easily moved to new locations to meet later if advisable.

The houses actually are permanent, although mobile. Three sizes are available, one, two and three bedroom types.

Increases in Production, Topic At Detroit A.I.S.E. Meeting

Detroit

• • • **"Increase in** Production With Existing Equipment" will be discussed Oct. 14 by C. L. Altenburger, research engineer, Great Lakes Steel Corp., Ecorse, Mich., at the October meetings of the Detroit district section, Association of Iron and Steel Engineers. The meeting will be held at 8 P.M. following dinner at "The Stockholm," 1914 E. Jefferson Avenue.

TRADE **AUTOMATIC** MARK

MANUFACTURERS FOR OVER 30 YEARS

Electric Propelled INDUSTRIAL TRUCKS

Fig. 10537-39. Heavy-duty Telescopic Fork Trucks stacking 10,000-lb. bundles steel plate after transporting from receiving. Lower view shows same truck servicing one of many Die-presses with steel plates. Note how truck places load at convenient height to operator.

Fig. 10562. Operator withdrawing Special Skid Racks loaded with Crankshafts from Heat Treat Ovens. These are transported to storage and box-cars for shipment to assembly plants. Fork Truck illustrated is available in 3,000- to 7,000-lb. capacities.

Fig. 10541. One of the many efficient production jobs performed by "AUTOMATIC" 10,000-lb. High Lift Trucks. Truck illustrated facilitates general transportation and placing of Bundled Steel Plate at Presses.

Fig. 10544. Outside storage of engine blocks on pallets in unit loads with "AUTOMATIC" Fork Trucks provides an economical handling system with highest efficiency for Inventory and Production Control.

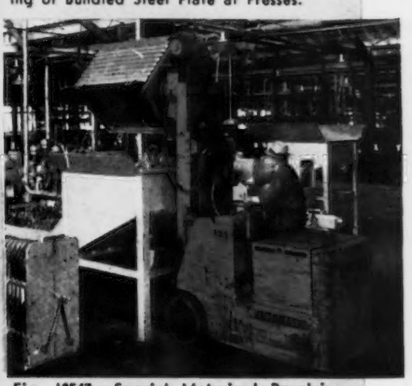


Fig. 10547. Special Motorized Revolving Fork Attachment built integral with Telescopic Fork Truck Lift provides efficient system for charging hoppers as shown with miscellaneous small parts as required for Water and Oil Pump Assemblies — also Valve Guides, Connecting Rods, etc.

MODERN PRODUCTION TOOLS CONTRIBUTING IMPORTANT ECONOMIES TO MODERN BUSINESS

• The "Electric Propelled" Fork Trucks, Die Handlers and Lift Trucks illustrated here are typical of the complete range of "AUTOMATICS" Time Proven Production Tools. These are offered to the Automotive and Aircraft and Metal Industry to facilitate improved handling methods and modern low-cost co-ordinated handling systems regardless of load 2,000 or 30,000 lbs.

Hundreds of these "AUTOMATICS" shown here are today operating in many modern plants in United States, Canada and Foreign Countries. They are vital factors twenty-four hours, day in, day out, contributing successful, dependable, economical, profitable materials handling, transportation and stacking. Each of these "AUTOMATICS" reflect the ultimate in Modern Design — Sturdy Construction — Greater Capacity Facilities — Increased Efficiency—Dependable Performance—Flexibility with Precision and Safety.

REQUEST DETAILS AND LITERATURE

Perhaps one of these "AUTOMATICS" shown is just the type you need right now! Write or 'phone today for full details and prices without obligation.

AUTOMATIC TRANSPORTATION COMPANY

Div. of the Yale & Towne Mfg. Co.

75 W. 87th Street — Chicago, Illinois

Listed Under Reexamination Service of UNDERWRITERS' LABORATORIES

Fig. 10554. One of the many production tasks performed by "AUTOMATIC" Fork Trucks is unloading unit loads of radiators from box-cars and transporting to storage and assembly.

Fig. 10559. Unit load of steel plate blanks formed for rear axles being placed in production storage by "AUTOMATIC" Center-Control Fork Trucks. Capacities 3,000 to 7,000 lbs.

Fig. 10536. Heavy-duty "AUTOMATIC" Die-handler, 20,000 lbs. capacity. Fully equipped with latest motorized Die Loading and Unloading Platform to facilitate accurate Die Placing and efficient transportation to and from storage.

WHEN YOU BUY TRUCKS · · *Buy* "AUTOMATIC"

Price Schedule on Steel Jobber Items Will Be Set Soon

Washington

• • • **A new iron and steel** price schedule covering sales of "seconds," "rejects," and "prime products" by jobbers, dealers and distributers is planned by OPA in an effort to halt "exorbitant" prices and alleged profiteering. The price agency fixed no time for the contemplated order, but merely said that it would be issued in the near future.

The new schedule, which marks the establishment by OPA of maximum prices for steel products sold in any quantity by mills, warehouses, jobbers, distributers, dealers, agents or brokers, will cover products already included under Price Schedule No. 6, which fixed ceiling prices for iron and steel sold by primary producers.

Price Administrator Leon Henderson said in issuing the order that leading steel jobbers have cooperated "admirably" with OPA since steel prices were frozen at first quarter levels, by keeping prices in proper relation to the mill prices set by the schedule.

"In recent months, however, largely because of the great demand for steel generated by the defense program," Mr. Henderson added, "certain members of the trade have demanded exorbitant prices from manufacturers in urgent need. Numerous complaints have reached my office, citing cases where consumers in need of steel have been compelled to pay prices ranging from 50 per cent to 200 per cent above those generally quoted. In many instances, 'seconds' and 'rejects'—steel containing imperfections—have been sold at prices considerably higher than those charged for steel of first grade.

"This is profiteering, pure and simple, and must be stopped."

OPA estimates indicate that about 85 per cent of all iron and steel is sold by steel mills directly to consuming industries, with the remaining 15 per cent bought by jobbers, distributers, and dealers for resale. An estimated 11,800,000

OPM Form PD-1 May Be Reproduced

Washington

• • • In order to simplify the filing of applications for preference ratings, form PD-1 — the standard form of application for ratings—may be reproduced by those who wish to use it, OPM has announced. Anyone who reproduces form PD-1 must, however, follow exactly the phraseology, the size, the format and the color of the official blanks furnished by the Division of Priorities, it was pointed out. In general, Priorities Division forms and orders may not be reproduced by persons using them except when reproduction is specifically authorized on the form or order.

Photo by Wide World

DEFENDS AUTO CUT: Strict curtailment of automobile production is necessary partly because the automotive industry is one of the largest consumers of steel, Joseph L. Weiner, assistant to Leon Henderson, price administrator, recently told a special House committee.

net tons of iron and steel will be thus distributed in 1941 as against 6,686,000 tons in 1940.

Expressing concern despite the comparatively small percentage of steel distributed by reselling, Mr. Henderson's steel experts point out that in certain items a substantial amount of the total production is handled in this manner. For example, in 1940, jobbers, dealers, and distributers resold 54 per cent of the entire production of iron and steel pipe and tubes; 40½ per cent of all wire and wire products and slightly over 46 per cent of all galvanized sheets, as well as important quantities of tool and alloy steels.

Priority Problem Office Is Opened in Buffalo

Buffalo

• • • **A new field office** to aid manufacturers with priority problems was operating here this week in the regional OPM office. Work of the field office will include helping manufacturers who have written Washington regarding priorities and who have not received satisfactory replies, Manager Paul R. Smith announced. The office also will assist manufacturers in filing priorities applications or those seeking preferential treatment in obtaining supplies and raw materials. Its function will be explained at the Buffalo area's second defense clinic to be held here Oct. 21.

Auto Sheet Sales Cut to Free Material for Other Uses

Pittsburgh

• • • **When the reduction in** sheet sales to the automotive industry becomes fully effective, sheet makers expect to find more material available to other essential steel users. The amount of such material which may go to non-defense consumers, however, will be controlled somewhat by national defense requirements. The latter may take the form of additional plate tonnage from wide strip mills, an increase in the amount of heavy hot rolled sheets for drum stock carrying high priority ratings, and the availability of raw steel which can be allocated to sheet mills for ordinary sheet production.

Photo by International

PAINT SPRAYER: The "gargoyle" above is Sam W. Kelly, of Jeanette, Pa., operator of a paint spray gun in the Pennsylvania railroad's Pitcairn shops. The Pennsylvania railroad plans to build 10,520 new railroad cars during 1941 and 1942.

Buffalo Forge Co. Holds Orders Totaling $13,470,000

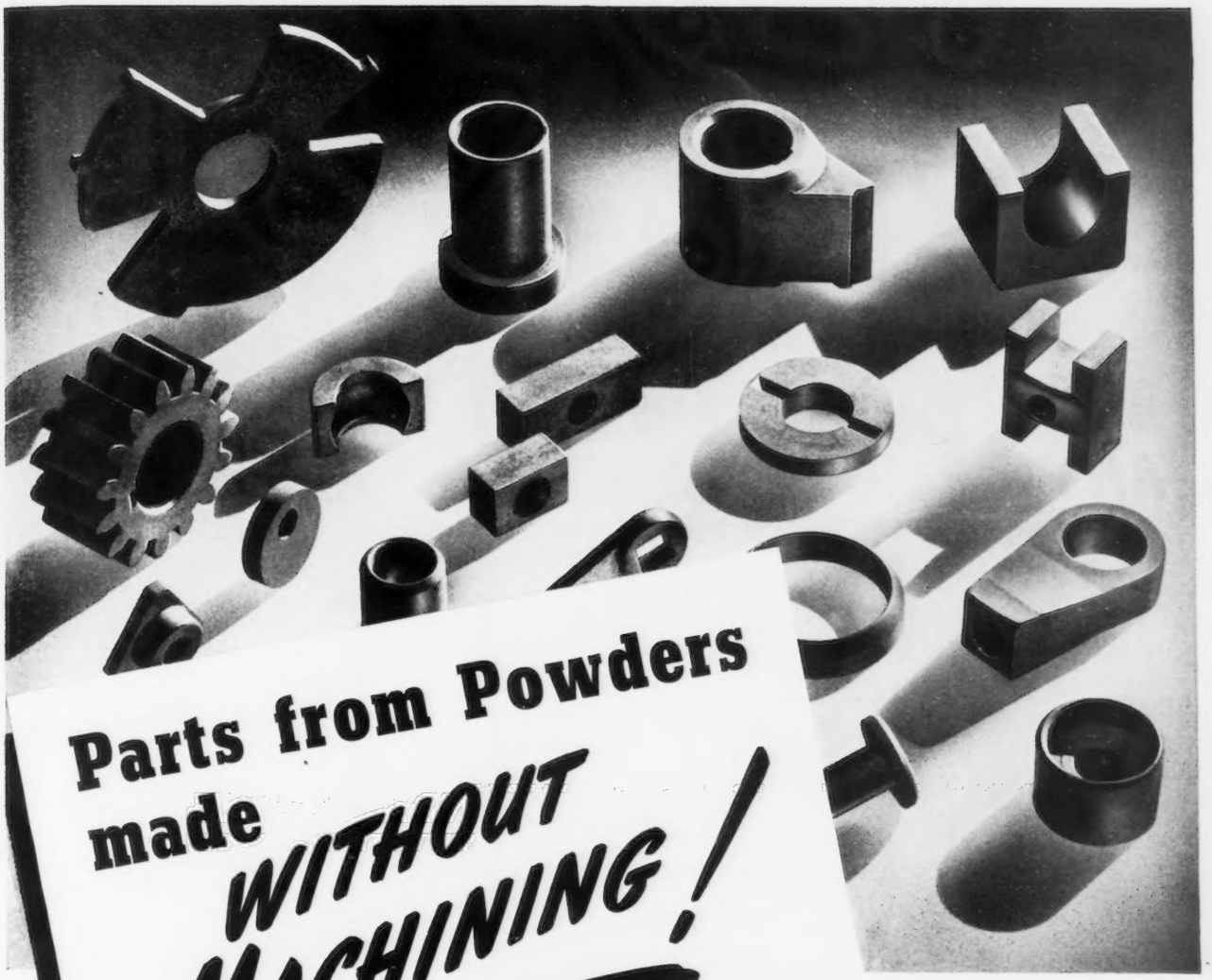
Buffalo

• • • **Unfilled orders** of Buffalo Forge Co. and its subsidiaries were $13,470,000 at the start of this month, it was announced as an underwriting syndicate of brokers offered 115,120 shares of the company's common stock for sale at $18.50. Of the orders, $8,246,000 are specified for delivery within the next twelve months.

P. N. Guthrie, Jr., Joins New York Export Firm

• • • **P. N. Guthrie, Jr.,** formerly president of Reading Iron Co., has joined S. C. Marx and associates in Allied Metal Products & Supplies Corp. of 39 Cortlandt Street, New York.

At present much of the company's steel business is largely with South American republics through their respective governments.



Parts from Powders made WITHOUT MACHINING!

Small parts engineered by Moraine from iron powders have opened up new design possibilities, substituted for scarce materials, and eliminated machining operations for scores of manufacturers. For example, in a machine saw guide-block, Durex Iron replaced hardened and ground steel at lower cost, provided self-lubrication and excellent wear-resistance. Durex Iron cams and other parts of complex shapes are made to close tolerances without machining. Moreover, smooth finish, self-lubrication, and high wear-resistance make Durex Iron suitable for many bearing applications, frequently replace bronze bearings at lower cost. Check powder metallurgy as applied to your problems. Write for new bulletin on Durex Iron: Form 102 A.

MORAINE

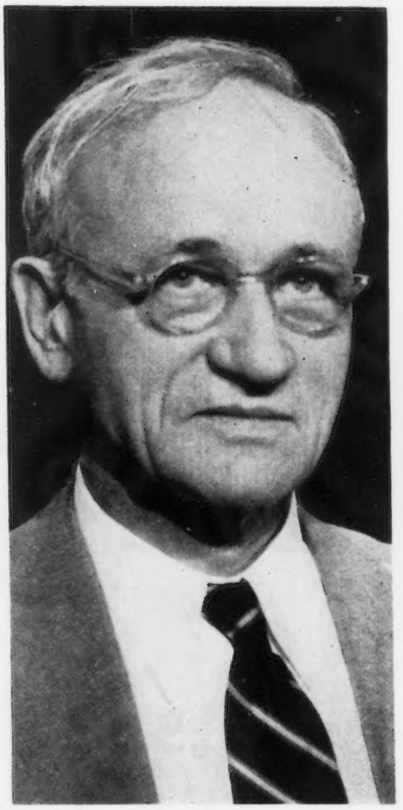
Pioneer in Powder Metallurgy

MORAINE PRODUCTS DIVISION, GENERAL MOTORS CORPORATION, DAYTON, OHIO

Buffalo Area Needs 27,000 New Workers; Has But 2300

Buffalo

• • • **Defense plants** in this city face a serious labor shortage, Otto W. Winter, national chairman of the Emergency Defense Training Committee of the American Society of Tool Engineers, has announced. "Some 27,000 additional workers still will be needed for such companies as Curtis and Bell Aircraft, Buffalo Arms, etc. There are at present registered in Erie County approximately 9500 men theoretically available," Mr. Winter said. Deducting profession and commercial workers, juniors, and those physically unemployable, Mr.Winter has arrived at a figure of 2300 possible workers, against the needed 27,000.



FOR "POP" SMITH: Twenty years ago J. Hugo "Pop" Smith founded the Wesson Co., Detroit manufacturer of tungsten carbide and high speed cutting tools in a small garage. Recently 200 Wesson employees held a farewell party for Mr. Smith who has retired as the company's president.

Monarch Lathe Output Will Be Double 1940 Record

Sidney, Ohio

• • • **During a visit** of Naval officers from Washington and Cincinnati to the Monarch Machine Tool Co. plant here, Wendell E. Whipp, president, revealed that the company's 1941 output of lathes would be close to double that of the 1712 built and shipped in 1940.

Mr. Whipp stated, "Up to Oct. 1 we shipped this year over 2400 lathes, and we still have our three best months of this year before us. In September we built 329 lathes."

The occasion for the inspection was Monarch's recent $625,000 plant addition, reported to be the first Emergency Plant Facilities Contract sponsored by the Navy that is fully completed and in operation.

McKAY HEAVY DUTY ROLLER LEVELLER

Light armor plates for tanks require special heavy duty roller levellers, such as the one illustrated above.

McKay Levellers are specially designed for leveling the various widths and thicknesses of all kinds of plate.

GIVE US YOUR REQUIREMENTS and WE WILL SUBMIT SPECIFICATIONS FOR THE SIZE AND TYPE OF LEVELLER YOU NEED.

The **McKAY MACHINE** *Company*

ENGINEERS AND MANUFACTURERS OF SHEET, TIN, AND STRIP MILL EQUIPMENT

YOUNGSTOWN, OHIO

ASSOCIATED COMPANY

The WEAN ENGINEERING CO., Inc. • WARREN, OHIO

Hamilton Coke & Iron Unit Out of Merchant Iron Field

Hamilton

• • • **Receipt of** instructions from Washington on tendered business for the third and fourth quarters puts the Hamilton Coke & Iron unit of American Rolling Mill Co. definitely out of the merchant iron field, either as producer or broker, at least for the present time and probably "for the duration." This unit had a number of tendered contracts from old customers but Washington has ruled that these orders should be placed in the hands of another producer and that Hamilton will definitely be out of the picture and receive no portion of profits or responsibility on these orders.

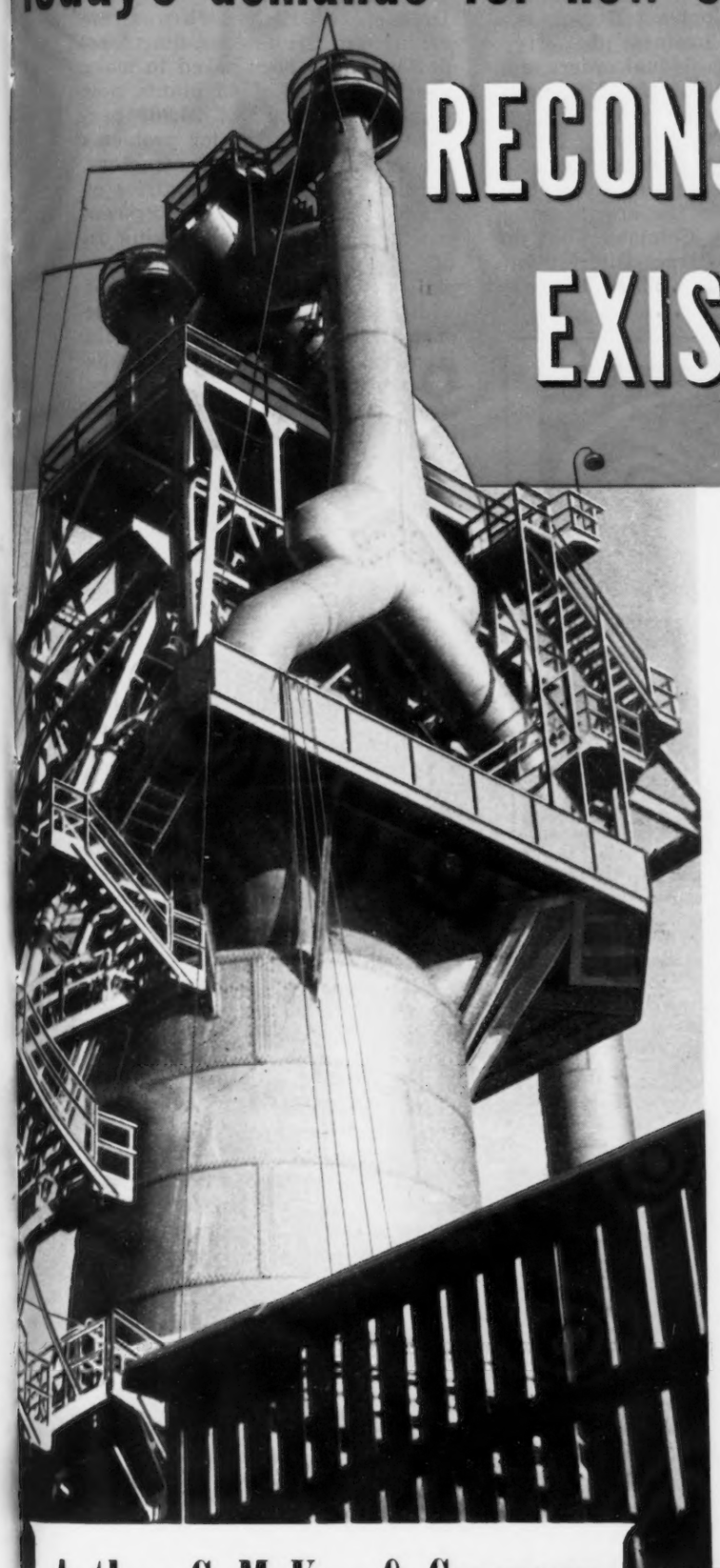
NELSON DAMAGED: Above is the Nelson, one of Britain's largest battleships, which recently was reported damaged by dive bombers in the Mediterranean. The ship is shown in Portsmouth, Eng., harbor.

Torpedo Net Plant to Be Built at Palmer, Mass.

• • • **Wickwire Spencer Steel Co.,** Palmer, Mass., has started construction of a 150 x 104 ft. plant for manufacture of submarine torpedo nets. Abathaw Construction Co., Boston, has the contract and expects to complete the plant on or before Dec. 1.

Today's demands for new capacity need not delay

RECONSTRUCTION OF EXISTING UNITS



REGARDLESS of the many new projects being developed and executed by McKee engineers, Arthur G. McKee & Company are prepared, as always, to handle the modernization and enlargement of your existing units.

To insure maximum iron and steel production present plants must be maintained at peak efficiency.

McKee engineers will bring all the broad experience of this organization to bear in rebuilding present units for increased production and utmost operating efficiency.

The McKee Method of Undivided Responsibility in One Organization results in faster, more efficient engineering and construction with an absolute minimum of interruption of your present production.

Arthur G. McKee & Company

Engineers and Contractors

2300 CHESTER AVENUE · CLEVELAND, OHIO

30 ROCKEFELLER PLAZA, NEW YORK, N. Y. ★ COMMERCE BUILDING, HOUSTON, TEXAS

160 Orders Result Of Defense Caravan

Cleveland

• • • **Almost $2,000,000 in** actual orders were placed during Ohio's defense "Caravan," which covered eight cities in this area, it was announced by Herman H. Lind, deputy regional coordinator of the Division of Contract Distribution of OPM. The business placed represents 160 individual orders, and it was stated that 196 other negotiations are now under way, involving over 2000 items.

The interest evidenced in this drive to increase sub-contracting has resulted in the opening of a new office at Columbus by the Division of Contract Distribution.

The Training-Within-Industry Division of OPM, which was represented at the defense clinics, reported it has been asked to make special studies of 43 plants now employing a total of 25,869 persons. One of the major problems facing defense sub-contractors, judging from typical inquiries of the Training-Within-Industry representative, was the breaking in of new employees to perform skilled work and the training of additional supervisors to manage expanding activities or handle labor in additional shifts. Large companies contributing to the training program included: American Steel & Wire Co., Warner & Swasey Co., Thompson Products Co., General Electric Co., Transue & Williams Steel Forging Corp., Alliance Machine Co., Lincoln Electric Co., and Pipe Machinery Co.

Engineering Groups Set Up Technical Defense Board

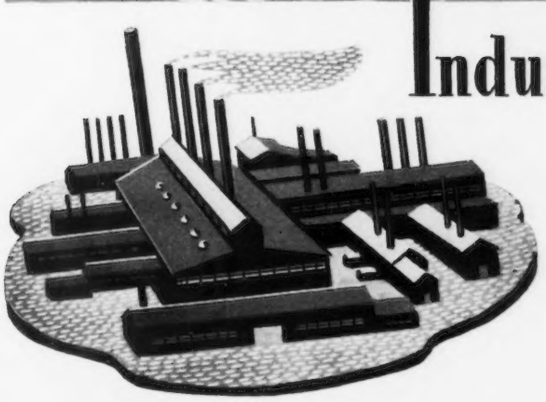
• • • **Establishment of the Engineers'** Defense Board, composed of engineers and technologists from the several national engineering societies, to deal with technical problems on shortages, substitutions, conservation, raw materials, production and reclamation in the nation-wide adjustment under the impact of the defense effort, was announced last week.

With an initial membership of five representatives each, from the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Society of Automotive Engineers, and the American Institute of Chemical Engineers, the new organization will assist the government with engineering knowledge and experience on questions connected with military preparedness and will attempt improvements of standards and practices of long standing where savings of materials can be made.

Robert E. McConnell, OPM consultant, is chairman of the new board, Dr. Harry Rogers, president of Brooklyn Polytechnic Institute, is vice chairman, and Dr. A. B. Parsons, secretary of the American Institute of Mining and Metallurgical Engineers, is secretary.

106 SOLD IN LESS THAN 4 YEARS

59 ORDERED IN LAST 12 MONTHS



Industry goes "all out" for AMCO Pit Furnaces

When introduced four years ago, AMCO Pits established new production, fuel, maintenance and other unprecedented records for ingot-heating.

Today, because of continued refinements and improvements, AMCO Pits provide even greater over-all economies, PLUS 10% further increase in production.

7

The AMSLER-MORTON COMPANY
FULTON BUILDING • PITTSBURGH, PA.

Two Experts Will Work for Simplification of Products

Washington

• • • **Two Bureau of Standards** specialists have been designated by Commerce Secretary Jesse Jones to head a new organization under the OPM concerned with the simplification of manufactured products and utilization of substitute materials operating under the national defense program.

They are E. W. Ely, chief of the division of simplified practice, and Robert A. Martino, of the Bureau's codes and specifications section. At the same time Robert F. Martin, chief of the Commerce Department's division of industrial economy, was appointed liaison officer between the department and other defense agencies working on simplification.

Coming Events

Oct. 12 to 15—American Society of Mechanical Engineers, fall meeting, Louisville, Ky.

Oct. 14 to 16 — American Railway Bridge and Building Association, Chicago.

Oct. 14 to 17—American Institute of Steel Construction, annual convention, New York.

Oct. 16 to 18—American Society of Tool Engineers, semi-annual meeting, Toronto.

Oct. 20 to 24—National Metal Congress, Philadelphia. Annual meeting of American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers, and Wire Association. Also, Exposition of equipment, materials and processes.

Oct. 20 to 22 — American Gear Manufacturers' Association semi-annual convention, Edgewater Beach Hotel, Chicago.

Oct. 20 to 22—American Gas Association, Atlantic City, N. J.

Oct. 21 to 23—Manufacturers' Products Exhibit, Sponsored by Purchasing Agents' Association of Baltimore, Baltimore, Md.

Oct. 23 and 24—Society of Automotive Engineers, Tulsa, Okla.

Oct. 24 and 25—Foundry Equipment Manufacturers Association, annual meeting, White Sulphur Springs, W. Va.

Oct. 28 to 31—National Association of Refrigerating Engineers, Detroit.

Oct. 30 to Nov. 1—Society of Automotive Engineers, National aircraft production meeting, Biltmore Hotel, Los Angeles.

Starrett Brings Out Book For Student Machinists

• • • **As a timely contribution** to defense training, the L. S. Starrett Co. of Athol, Mass., has published a manual of modern shop practice called "The Starrett Book for Student Machinists." Combining much of the material formerly published in two well known Starrett books, the new book is actually both an instruction manual and a ready-reference handbook. It sells for 75c.

The text was prepared in cooperation with a number of leading vocational school and industrial shop training instructors. It contains 184 pages, over 200 diagrams and photographic illustrations and 30 reference tables. The book includes such chapters as: How to read working drawings, precision tools and measuring practices, how to read a micrometer, fits and tolerance, bench work, metal sawing, drilling, lathe work, tool making, jigs, and fixtures, etc.

"rip off the roof" *roared* J. M.

"If you need more room, rip off the roof," roared J. M. And we couldn't blame him. The shop was as crowded as Coney Island on the Fourth of July. Still, there was plenty of room to stack material but the hoisting equipment was obsolete.

Then Bill Kane, the plant engineer, tipped J. M. off to the new R & M all-steel, *low-headroom* hoist.

Now the shop is "hitting the ceiling." We're stacking material inches from the plaster. Squeezing into corners . . . making every square foot count . . . handling raw material and finished products 30 to 35% faster . . . saving plenty of time and money.

You wonder where this new R & M "ceiling hugger" gets all its lifting power . . . nimbleness . . . speed. The answer is engineered perfection . . . and *steel*—quality steel for the frame and all working parts . . . steel from track to hook.

Let an R & M expert show you how you can utilize the space you've got and still speed your material handling. There's a convenient R & M hoist division office near you for quick service. It will pay you to "take it up" with R & M—today.

Here's R & M's famous new F-½, all-steel, low-headroom hoist, 1000 and 2000-lb. capacity. Write today for Bulletin No. 800 for complete description and specifications.

R & M HOIST & CRANE DIVISION OFFICES

Atlanta.....319 Walton Bldg.
Baltimore. Lombard & Concord St.
Boston.....55 Long Wharf
Buffalo....2005 Delaware Ave.
Chicago...2400 W Madison St.
Cincinnati.....418 New St.
Cleveland.352 Rockefeller Bldg.
Dallas.....1100 Cadiz St.
Denver.....1420 16th St.
Detroit....2921 E. Grand Blvd.
Houston..3715 Harrisburg Blvd.
Newark.....700 Bergen St.
New York.....200 Varick St.
Philadelphia...421 N. Broad St.
Pittsburgh...H. W. Oliver Bldg.
Providence....44-46 Clifford St.
San Francisco..237 Rialto Bldg.
Seattle.....216-17 Walker Bldg.
Syracuse..204 State Tower Bldg.
Montreal.....Lyman Tube & Supply Co., Ltd.

ROBBINS & MYERS • INC.

HOIST AND CRANE DIVISION • SPRINGFIELD, OHIO

Consumer Goods Output In Canada Ordered Cut 75%

Toronto

• • • **Delivering a blow** at production and sale of non-essential consumers' goods in wartime, C. D. Howe, minister of munitions and supply, named radios, refrigerators, stoves, vacuum cleaners and electric washing machines as supplies under the provisions of the Munitions and Supply Act. Simultaneously, Alan H. Williamson, controller of supplies, with approval of R. C. Berkinshaw, chairman of the Wartime Industries Control Board, called for preliminary reduction of future domestic production of these goods to 75 per cent of 1940 output. The order became effective Oct. 1.

The controller plans to set up advisory committees in each of the industries affected. Thus the industries themselves will cooperate in the diversion of their output from civilian to war needs. Mr. Howe emphasized that this action is but a part of further studies and steps which will be taken to harness Canadian industry to the ever expanding demands of war.

Photo by Harris & Ewing

METALS CONTROLLER: G. O. Bateman, above, is the Metals Controller for the Dominion of Canada.

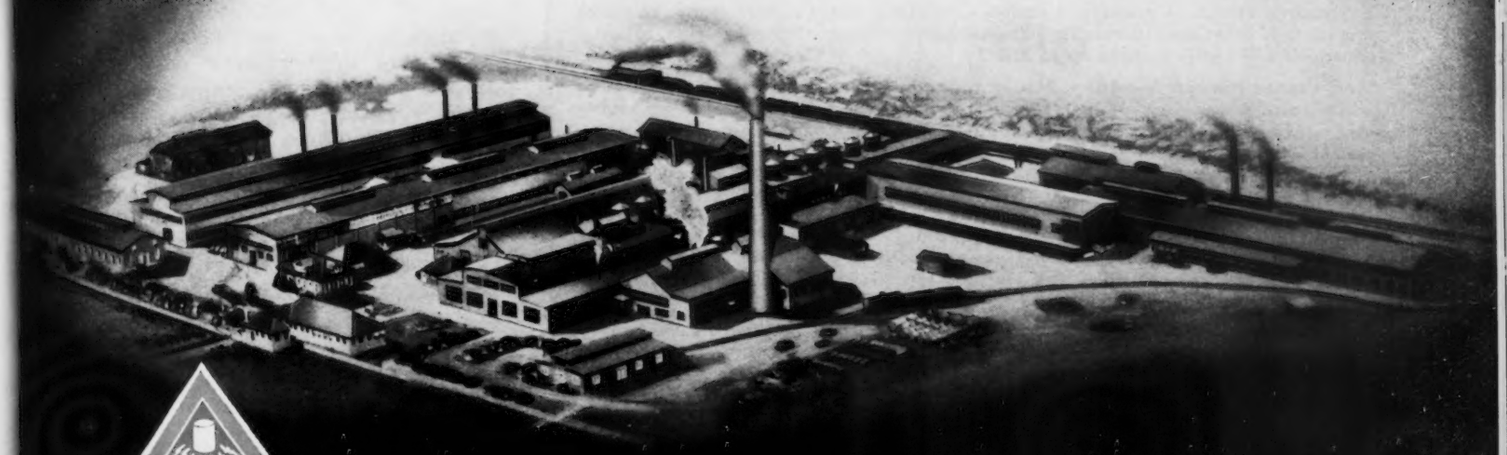
Witherow, Blaw-Knox Head, To Speak at Alabama Meeting

Birmingham

• • • **William Porter Witherow,** president of Blaw-Knox Co., Pittsburgh; Brig. Gen. Charles Hines, secretary of the Army and Navy Munitions Board, and Emmett Francis Connely, president of the Investment Bankers Association of America, are scheduled to be speakers at the annual meeting of Associated Industries of Alabama which will be held here Oct. 17. Theme of the meeting will be "Defense for America."

LATROBE

OVER A QUARTER-CENTURY OF SPECIALIZATION IN TOOL STEELS



LESCO

THE MARK OF BETTER TOOL STEELS

Latrobe's entire facilities and resources are devoted to the making of tool steels of the highest quality! In pioneering the refining of steels exclusively in electric furnaces; in progressive engineering and research; in practical, helpful service to users . . . Latrobe has consistently maintained its leadership for three decades.

This long, specialized experience is at the service of the nation's leading industries in meeting the needs of American defense!

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT • LATROBE • PENNSYLVANIA

Idle Lathe Capacity Being Uncovered by LeBlond

Cincinnati

• • • **In an attempt to uncover** available lathes for work in the national defense program the R. K. LeBlond Machine Tool Co. is mailing a questionnaire this week to an extensive list of firms which might have such idle equipment and be willing to sell it in the interest of national defense. LeBlond has already sent out a thousand questionnaires on a sampling basis and received 60 replies which list 16 lathes of a wide variety of types and sizes that are available. The total mailing of questionnaires is expected to exceed 7000.

The message from LeBlond says: "The U. S. defense effort is requiring far more machine tools than the machine tool industry can produce at present. Like other members of the industry, we at LeBlond are working 24 hours a day, but this is not enough for the present emergency. So we are planning an information service that will attempt a two-fold task with a single purpose: to find idle lathes, to find buyers for those idle lathes and to place in the hands of national defense manufacturers urgently needed turning capacity."

The information service will be free to both buyer and seller.

Industrial Catalogs

Detroit

• • • **A new 200-page** catalog bound in stiff covers has been issued by the Midwest Tool & Mfg. Co., 2360 West Jefferson Avenue, Detroit, covering its line of precision metal cutting tools. These include milling cutters, end mills, keyway cutters, form tools, reamers, counterbores, spotfacers, gear cutters and drills. Various types of adjustable tool holders and hardened taper sleeves are also described and illustrated as well as a line of cemented carbide tipped tools. Considerable engineering data and tables are appended, including a table of speeds and feeds for milling various metals. This catalog No. 17 is indexed for ready reference.

Cincinnati

• • • **Illustrations and brief** descriptions of all the current design machines made by Cincinnati Milling Machine & Cincinnati Grinders, Inc., are to be found in the company's latest publication, No. M-995. Beginning with milling machines—vertical, plain and universal, dial type, high power, Hydro-Tel, plain automatic and Hydromatic styles — the loosely bound catalog proceeds to list broaching machines, tool and cutter grinders, milling machine attachments, the Filmatic spindle bearing for precision grinders, and finally grinding machines of the following types — hydraulic universal, plain hydraulic, plain self-contained grinders, centerless grinders and centerless lapping machines.

Rebuilt Brazilian Road To Facilitate Ore Movement

• • • **Rehabilitation** of Brazil's Victoria-Minas Railroad, 350-mile narrow gage road owned by the government, would permit these transportation facilities to handle 1,000,000 tons of high grade iron ore from the Itabira district, where an estimated 220,000,000 tons of hard ore are located.

Commerce Department dispatches say the present equipment includes 38 steam locomotives and 270 freight cars and that only 173,000 metric tons of all classes of freight were handled in 1938. The Itabira district lies almost equidistant 225 miles from the port of Rio de Janeiro to the south and the port of Victoria to the east.

Pig Iron Output Rises in Canada During August

Toronto

• • • **Pig iron production in Canada for August was 105,795 gross tons compared with 102,005 tons in July. The month's output included 86,972 tons of basic iron, all for further use of producing companies; 7604 tons of foundry iron and 11,219 tons of malleable iron, all the latter two grades for sale.**

For eight months ending Aug. 31 cumulative pig iron output was 833,351 gross tons.

Production of ferro-alloys in August amounted to 16,251 tons, against 17,599 tons in July. For the first eight months of the year output totaled the high record of 121-730 gross tons.

Production of steel ingots and direct steel castings for August was 202,746 gross tons, compared with 197,316 tons in July. In August output included 193,034 tons of steel ingots and 9712 tons of castings.

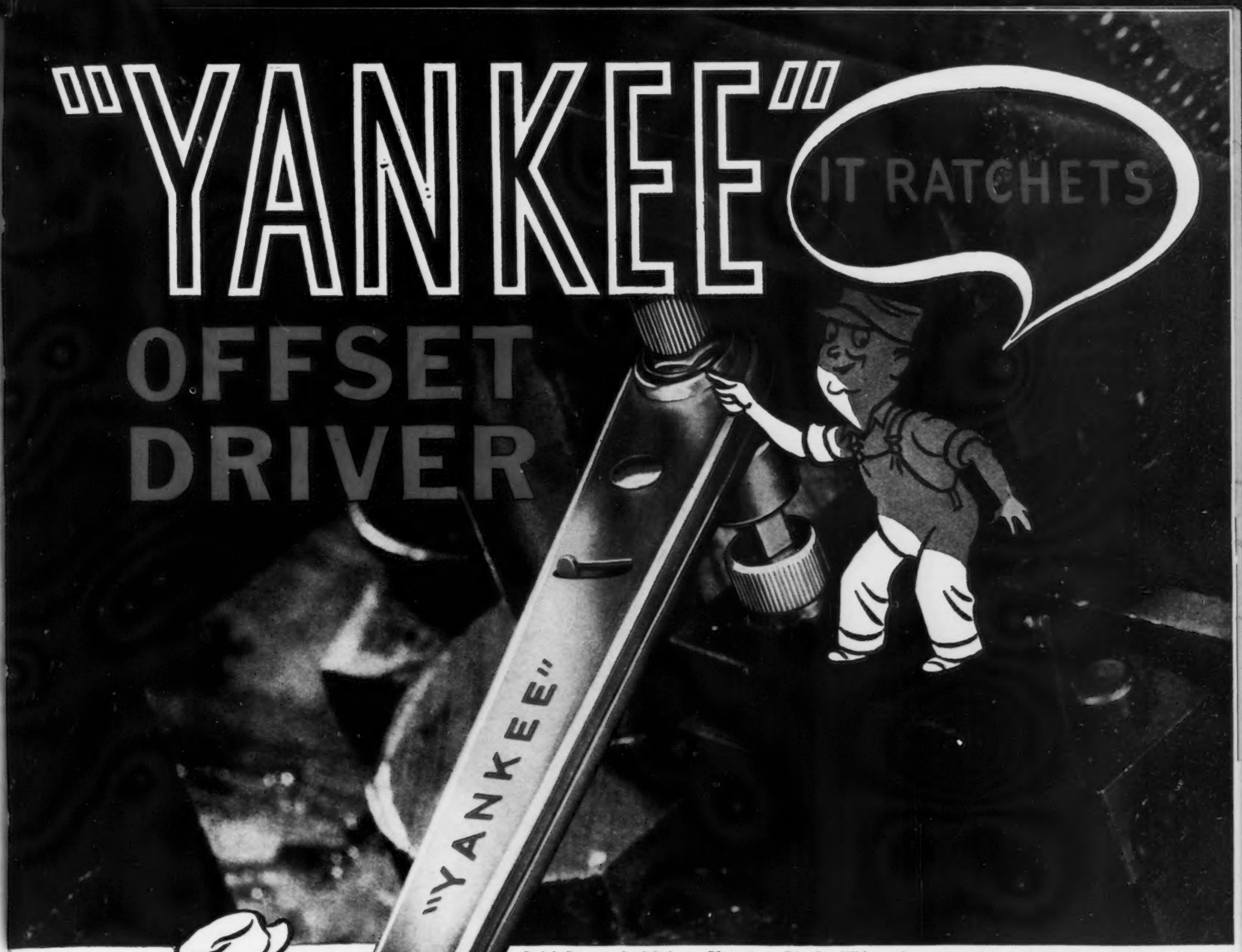
In the eight months ending with August cumulative output of steel ingots and castings was 1,548,498 gross tons.

July Iron Ore Imports Drop to 196,326 Tons

• • • **Iron ore imports** for July declined to 196,326 gross tons from 224,928 tons in June according to the Department of Commerce. Chile was the leading source for that month, contributing 142,600 tons. Total manganese ore imported was 32,714 tons with Brazil leading with 11,342 tons supplied. Imports from the U.S.S.R. declined to 35 tons in July from 2828 tons in June. Details of July ore imports follow:

	(Gross Tons)	
Iron ore		196,326
United Kingdom	28	
Canada	23,529	
Mexico	349	
Newfoundland & Labrador	7,020	
Cuba	15,300	
Brazil	7,500	
Chile	142,600	
Manganese ore (35% and over).		32,714
Battery grade, Gold Coast	1,321	
U.S.S.R.	35	
Mexico	42	
Cuba	7,483	
Brazil	11,342	
British India	2,614	
Netherlands Indies	571	
Philippine Islands	1,028	
Union of South Africa	590	
Gold Coast	7,685	

"YANKEE" OFFSET DRIVER



Quick Removal of Stripper Plate from Die Set Without Removing Punch Holder from Press

FOR tight jobs like this you've been wanting close-quarter tools with "Yankee" speed and power. Now you can get them! See this new "Yankee" No. 3900. "Yankee" gets IN to the job. It ratchets. Job's done! "Yankee" Adapters take care of almost any and every type of screw. Bolts, too.

"YANKEE" Offset Ratchet Drivers are available in sizes to meet practically any close-quarter condition in driving screws or bolts. With these new "Yankee" Offset Tools there are no "hard-to-reach" screws!

NO. 3900 — ACTUAL SIZE

"YANKEE" ADAPTERS FOR OFFSET DRIVER NO. 3900

No. 3901 SCREW DRIVER 5/16" x .045	No. 3902 SCREW DRIVER 1/2" x .060	No. 3911 HEX KEY 3/16"	No. 3912 HEX KEY 7/32"	No. 3913 HEX KEY 1/4"	No. 3914 HEX KEY 5/16"	No. 3921 SQUARE DRIVE 1/4"	No. 3922 SQUARE DRIVE 9/32"	No. 3923 SQUARE DRIVE 3/8"	No. 3931 PHILLIPS BIT 1 POINT	No. 3932 PHILLIPS BIT 2 POINT	No. 3933 PHILLIPS BIT 3 POINT	No. 3934 PHILLIPS BIT 4 POINT

ORDER FROM YOUR MILL SUPPLY HOUSE.
For complete showing of this new speed line of "Yankee" Offset Drivers . . . Adapters . . . Offset Kits,—Write for Offset Tool Folder "IA."

NORTH BROS. MFG. CO., PHILADELPHIA, U.S.A.

Standard Gearmotor Speeds Announced by AGMA

Wilkinsburg, Pa.

• • • **The American Gear Manufacturers Association** has recently announced a new standard speed program for gearmotors. The standard output speed program was selected with a series factor of 1.225, using 1750 r.p.m. as the base. This means that the next lower speed is 1750 divided by 1.225, or 1430 r.p.m. The next lower output speed is then obtained by dividing 1430 by 1.225, which is 1170 r.p.m., and so on.

The complete table of standard output speeds for concentric and parallel shaft integral horsepower gearmotors, based on 1750, 1430 or 1135 r.p.m. motor operating speeds, is as follows:

1430	190	25
1170	155	20
950	125	16.5
780	100	13.5
640	84	11.0
520	68	9.0
420	56	7.5
350	45	6.0
280	37	5.0
230	30	4.0

Horsepower rating and selection of motors was worked out and adopted in October, 1940, by the AGMA in the form of a "Proposed Recommended Practice for Gearmotors." At the same time the standard output speed program was adopted by the National Electrical Manufacturers Association (NEMA) and recommended to the gear association for favorable action, which made it possible for AGMA to adopt this program along with the rating practice.

Practically all gearmotor manufacturers are cooperating in this new standard speed and recommended practice as adopted by the association. This standardization program is expected to facilitate rationing of materials and control of inventories.

Labor Controversies Hinder Chicago Plant Operations

Chicago

• • • **Although production** losses have not been serious, certain mills here in the "Little Steel" classification have been suffering labor stoppages for several months. These occur almost daily, first in one department, then another. None are ever serious enough to cause widespread production gaps, nor to even gain publicity in local newspapers.

Red, White, Blue On Defense Orders

Middletown

• • • Defense orders at the American Rolling Mill Co. are now being sent through the mill on special order blanks, the back of which carries red, white and blue stripes. The card is so folded that the stripes plainly show, thus informing all employees of the purpose of the specific order as it goes through the mill.

Priorities to Be Discussed by Gear Makers Oct. 20-22

• • • **Defense** is to be the keynote at the meeting of the American Gear Manufacturers Association at the Edgewater Beach Hotel, Chicago, Oct. 20-22. The entire program has been made up around the current needs of the gearing industry, and the several activities are all pointed toward a better "All-Out" job for defense.

Practically the entire technical program is to be taken up with a symposium on gear tooth strength. In addition to this symposium, there will be reports on lubrication, a recommended practice for gear steels, and a progress report covering recent gear and roller wear testing. The commercial part of the program will be devoted to such matters of current interest as priorities, taxes, labor and customer relations.

On Wednesday morning, Oct. 22, Warren G. Bailey, priorities director of the OPM's regional office in Chicago, will discuss priorities and allocations as they apply to the gear industry.

The president of the association is W. P. Schmitter of the Falk Corp., together with the chairman of the technical committee.

Rail Mill to Close

Birmingham

• • • **Reflecting the need** for steel for more pressing defense purposes, the Tennessee Coal, Iron & Railroad Co. is scheduled to close down its Ensley rail mill here for one week, beginning Oct. 6. For the balance of October and for November the rail mill schedule calls for a production of 5000 tons a week. According to present plans, the mill also will be closed down one week in November.

3000 Refrigerator Workers At Dayton Face Layoff

Dayton, Ohio

• • • **The Federal** curtailment order for production of refrigerators will mean a layoff of about 3000 employees, according to the officials of the Frigidaire division of General Motors Corp. Officials of the company immediately began to work on plans to help relieve the situation. A statement from the division, called attention to the fact that the company has been transferring hundreds of workers to defense activities in the last several weeks. The layoff will be about 20 per cent of the total employment.

September Ore Shipments Are High Despite Obstacles

Cleveland

• • • **Although September** shipments of iron ore from the upper lakes were an all-time high for this time of year, the total of 10,311,517 gross tons reported by the Lake Superior Iron Ore Association fell below the all-time high of 11,496,303 gross tons established in August, 1941. Reasons for the decline included bad weather, the advent of the intermediate loadline starting Sept. 16, the one-day shorter month, and smaller participation in the traffic by Canadian ships.

So far this year, the record for every navigation month has been broken, and the total tonnage brought down from the upper lakes up to Oct. 1, 1941, amounted to 62,024,228, a gain of 13,789,001 gross tons over the cumulative movement up to the same time last year. Moreover, shipments during the balance of the season are expected to continue heavy, so that this year's total may rise to the unprecedented level of about 78,000,000 gross tons.

New Airplane Part Plant For Wrentham, Mass.

Boston

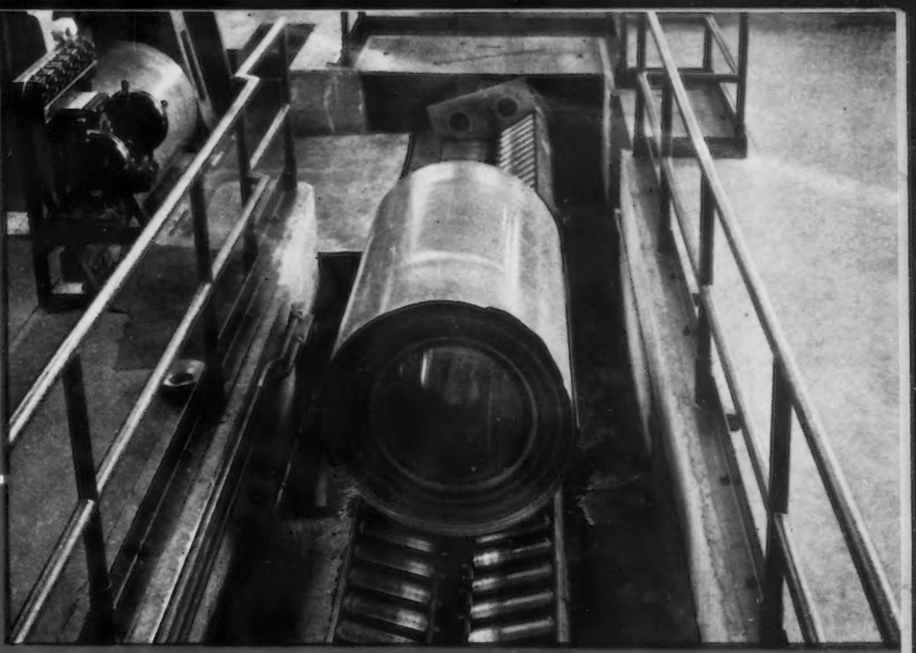
• • • **Wrentham Products Co.,** Wrentham, Mass., newly organized, has been notified by Washington that $442,258 has been allocated by the government for construction of a brick and steel plant for the manufacture of airplane parts. Contract has already been awarded a New York firm. Priorities for the steel have been granted. Company plans to employ 150 to 175 workers.

Clarke Heads Republic Supply

Cleveland

• • • **The Republic Supply Co.** announces the election of N. J. Clarke, Cleveland, as president; A. B. Judd, as vice-president and general manager; while other officers are J. H. Brooks, vice-president, and J. H. Lollar, Jr., secretary and treasurer. Mr. Clarke is vice-president of Republic Steel Corp., parent company of Republic Supply Company, which warehouses gas and oil supplies throughout the midcontinent.

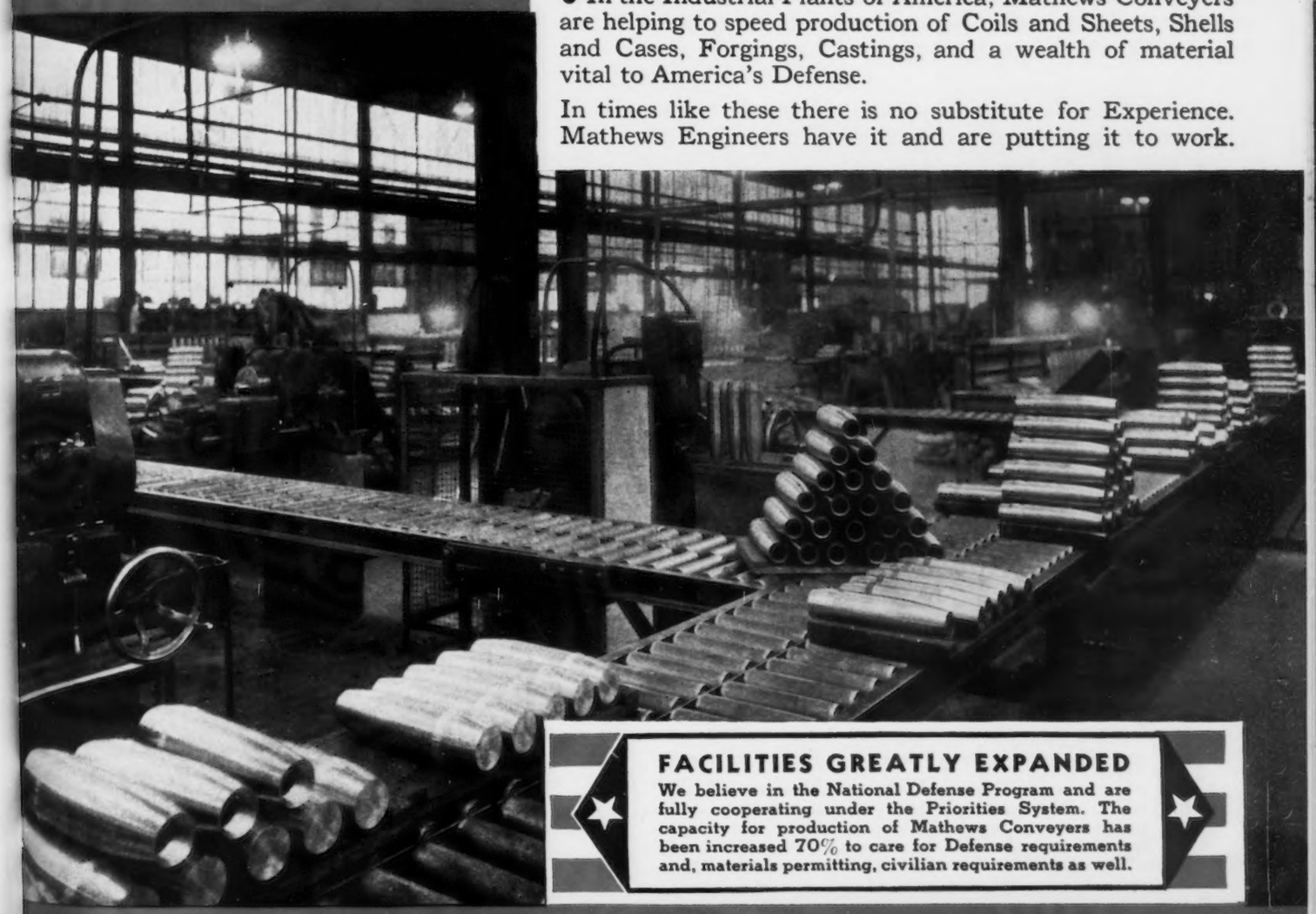
MATHEWS CONVEYERS



Keeping Defense Materials *Moving!*

● In the Industrial Plants of America, Mathews Conveyers are helping to speed production of Coils and Sheets, Shells and Cases, Forgings, Castings, and a wealth of material vital to America's Defense.

In times like these there is no substitute for Experience. Mathews Engineers have it and are putting it to work.



FACILITIES GREATLY EXPANDED

We believe in the National Defense Program and are fully cooperating under the Priorities System. The capacity for production of Mathews Conveyers has been increased 70% to care for Defense requirements and, materials permitting, civilian requirements as well.

MATHEWS CONVEYER COMPANY, ELLWOOD CITY, PENNA.

FIELD ENGINEERS AND SALES OFFICES LOCATED IN 30 INDUSTRIAL CENTERS

Ickes Delays in Asking Seamless

Washington

• • • **A hitch** in the plans of Oil Coordinator Harold L. Ickes to obtain seamless tubing for the construction of the proposed $80,000,000 Texas-to-New York pipeline was seen last week when Mr. Ickes told a special Senate committee investigating the alleged oil shortage that his division is still working on the problem and intends to explore the subject further before formally submitting a definite proposal to SPAB.

Although aides in Mr. Ickes' office previously insisted that they had petitioned OPM for priorities on 436,000 tons of seamless tubing and 17,000 tons of steel for valves, motors, pumps and machinery needed in the construction job, Mr. Ickes said his office had been refused twice in its request for steel plate priorities, and added:

"We have not presented the proposal for seamless tubing construction because when we go in we want to have our facts as to availability and time in which it can be delivered, and all that sort of thing. We are working on the question."

Robert E. Allen, the Oil Coordinator's director of production, asserted present plans call for a line of seamless steel pipe. He told the committee there are plants now making 24-in. seamless tubing which, he said, will be available Nov. 15. He did not identify the plants.

Spokesmen for the Oil Coordinator explained following his testimony that the application for priorities with OPM, while alive, is somewhat incomplete.

Mr. Ickes also said steel necessary in the production of oil is a problem where priorities already have made it difficult for new wells to be opened and old ones to be kept producing. He argued that a pipeline may require steel but that the alternative suggestion of building tankers and barges also will call for steel for "protection."

Mr. Ickes bitterly criticized the

Photo by International

BRITISH SUB IN U. S.—These workmen are repairing a section of the diving planes of the British submarine, Pandora, at the Portsmouth, N. Y., Navy yard. The Pandora is one of many British vessels of war that have come to American shipyards for general overhauling and repair.

committee for its recent report in which it denied the existence of a gasoline shortage, and he assailed J. J. Pelley, president of the Association of American Railroads, as a "lobbyist," charging that information given the committee by Mr. Pelley on the availability of idle tank cars was faulty. Mr. Pelley appeared before the committee later in the week, testifying that his organization still vouched for the figures furnished the committee on idle tank cars.

Following Mr. Pelley's testimony, Committee Chairman Francis T. Maloney said he saw no reason to revise the conclusion reached by the sub-committee several weeks ago when it reported that there is no shortage which cannot be overcome by utilization of existing facilities.

Arnold Attacks "Dominant Groups" Restricting Output

Washington

• • • **A Justice Department** program to attach under the anti-trust laws "concerted attempts by basic industries to hamper expansion" has been cited by Assistant Attorney General Thurman Arnold as a typical example of his efforts under the defense program to break down production obstacles created by "dominant groups."

Mr. Arnold said in a radio address that anti-trust investigations during the past year have shown that "there is not an organized basic industry in the United States which has not been restricting production by some device or other in order to avoid what they called the ruinous overproduction after the war."

He charged that for 10 months the country's defense effort has been hampered by the attitude of powerful private groups who fear the expansion of production because it may destroy their domination of industry after the war. He mentioned specifically the aluminum, steel, and railroad industries as groups "afraid to develop new production themselves" and, without calling the Gano Dunn report by that name, asserted that "only last March an authoritative report on the steel industry gave the impression that there would be a surplus of steel for all civilian and domestic needs this year and next."

Mr. Arnold did not discuss details of his current anti-trust campaign, but asserted that unlike the situation prevailing during World War I, the anti-trust laws would not be put on ice during the present war because "we have come to realize the economic necessity of insuring small businessmen and farmers and consumers a place in a unified defense effort."

He listed the refusal of labor monopolies to remove restrictions now interfering with full production as another typical object of Justice Department attack. He referred to two bills pending in Congress designed to confine labor unions to their legitimate purpose, observing that there is no valid argument against the principles embodied in these bills. At the same time he called upon the lawyers of America to use their influence to see that anti-trust laws do not become class legislation.

Drive for Auto Scrap Extends to Indiana

Washington

• • • **A campaign** to increase the junking of worn-out automobiles will be extended this week to Indiana, the OPM has announced. At a meeting in the Claypool hotel in Indianapolis at 2 p.m., on Oct. 10, government officials will appeal to Indiana automobile wreckers and scrap dealers to strip more cars.

DEPOSIT A-C POWER... withdraw accurately controlled surges of D-C current for more uniform welding of aluminum

Tough job, aluminum welding. You need comparatively high voltage in a narrow current range. Aluminum and other alloys used in modern planes have a very narrow plastic range. How to get the exact welding current you need without disruptive surge demands on power systems, without installing costly auxiliary equipment, has long been a problem.

CONDENS-O-WELD solves the problem. Energy is drawn from a 3-phase a-c power line, rectified, stored electrostatically and released in accurately controlled discharges to the welding machine. A complete, compact, enclosed unit, Condens-O-Weld can be used with any electrostatic stored energy type resistance welder.

With precision control of voltage, current and wave form, aircraft producers are getting welds of uniform strength and soundness not possible with any previous method. If your welding problem demands action now, you'll be glad to learn that Condens-O-Weld units are *ready now!* For detailed data, write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

3 WAYS

CONDENS-O-WELD HELPS KEEP PLANE PLANTS AT PEAK EFFICIENCY

1. **BALANCED 3-PHASE LOAD** Power requirements spread over three phases, not concentrated in surge demand on a single phase.
2. **HIGH POWER FACTOR** Power factor approaches unity.
3. **MINIMUM PEAK KV-A DEMAND** Fast charging rate with efficient electrostatic storage of power cuts peak Kv-a demand to a minimum.

J-21173

Westinghouse CONDENS-O-WELD

New Wave of Strikes Causes Substantial Production Losses

• • • **A new wave of** strikes caused serious production losses in the metalworking industries during the past week, and led to predictions of a sharply stiffened attitude on the part of industrialists against flagrant contract violations and unprecedented demands being made by unionists.

The fear of layoffs appeared to be the inciting factor on an increasing scale, although wage questions continued prominent.

Carnegie-Illinois Steel Corp.'s huge Gary works was struggling back toward high operations after settlement Monday night of an unauthorized strike of crane operators which made 17,000 persons idle for two days. With only two of 52 open hearths operating Monday and only five of 12 blast furnaces producing, production of raw steel was only trifling and it was expected three days would be required before normalcy could be regained. Cranemen objected to the release of summer relief operators.

American Bridge Co.'s Chicago district plant went down Friday, Oct. 3, and resumed Monday. A dues drive which included clerks and supervisors, and a demand for the firing of four non-unionists were leading points in the dispute. The Wickwire Bros. mill at Cortland, N. Y., was strike-bound for the first time in its history Monday. Five mills of Niles Rolling Mill Co. were down Monday in a strike over restoration of a wage cut.

In some well informed quarters of the steel industry it was predicted labor disputes have been piling up toward the point where a showdown can be expected soon. The closed shop and "maintenance of membership" demands of the SWOC are still overhanging the industry and may lead to a last ditch fight, it is said.

Harassing sitdowns have affected production almost daily in some of the leading steel centers.

Meanwhile, the agreement reached last week between General Motors Corp. and the UAW-CIO for the protection of workers' seniority status in transfers to defense jobs was being studied close-

ly as a pattern for the entire auto industry. At Detroit, the fight to hold onto jobs in the face of widespread layoffs has become the biggest single factor leading to labor disputes recently.

Other strike developments during the past week included:

BIRMINGHAM—A strike which started Aug. 27 and affected more than 450 employees of Birmingham Stove & Range Co. ended Oct. 3. The union claimed it had won a contract with pay increases and checkoff provisions.

CLEVELAND — Another CIO strike at the Midland Steel Products plant began to affect automobile production early this week. The Studebaker plant at South Bend closed, throwing 6000 out of work, because of the lack of Midland frames. Willys - Overland, making Army "Jeeps," expected to suffer later unless the Midland strike ended.

NEW ORLEANS—A building trades strike began Oct. 6 at the Red River ordnance depot in Texas, causing 3500 to be idle.

BUFFALO — The Joseph T. Ryerson & Sons, Inc., plant here, closed since Sept. 17, reopened after workers accepted a wage increase of 2 cents per hour.

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Chicago

• • • **Steel production** has been affected by daily, isolated strikes. Although these wildcat strikes were more or less expected by "Little Steel," what is not so widely known is that the bigger mills who are already parties to union contracts have been suffering in the same way. Stoppages in these mills are steadily increasing, an indication that industry-wide shutdowns may occur if union does not win its fight.

At Gary, Ind., unionists have boldly violated their contract with Carnegie-Illinois Steel Corp. by going from one department to another to solicit members. Another case is the sitdown that occurred a few weeks ago in the boiler department of the Gary works. It is alleged that investigation brought from one worker the statement that the action had been authorized sub-rosa by union headquarters. The man responsible for the action, a member of the union grievance

committee, was suspended and subsequently requested a hearing before company officials as provided in grievance procedure. Fellow committee members appeared in his place but the management refused to proceed until the suspended employee himself appeared (as the contract specifies).

One member of "Little Steel" in the Chicago district, Republic Steel Corp., has escaped the daily stoppages suffered by Inland and Youngstown. Republic's mill is located in Chicago and it is widely understood that Chicago police will not tolerate CIO disturbances since the famous so-called "Memorial Day Riots" that took place here in 1937. Union officials are well aware of this police attitude and have studiously avoided creating a ruckus that would lead them to battle against Chicago's "finest."

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American Engineering Co. Strike Enters 2nd Week

Philadelphia

• • • **Management and the** CIO Industrial Union of Marine and Shipbuilding Workers marked time as the strike of 300 of the 570 employees of the American Engineering Co. entered its second week, tying up production of defense contracts. The plant has been producing anchor windlasses for 17 cruisers now being built in different shipyards. Two of these ships are the Cleveland and the Columbus, under construction at Camden, N. J.

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Aluminum Strike Ends

Cleveland

• • • **The five-day** strike of aluminum workers, members of an independent union, at the Monarch Aluminum Mfg. Co., Cleveland, ended Oct. 6 after the company's executive committee had accepted the union's demands for a wage increase. The new wage scale provides for general increases from 8 to 10c. per hr. and a 5 per cent boost in the piece work rate. About 250 men were involved.

Employment Rise Continues in Steel

• • • Employment in the steel industry rose during August to an average of 654,000 men, the sixteenth consecutive monthly increase since April, 1940, during which time a total of 151,000 new employees was added to steel company payrolls, according to the American Iron and Steel Institute.

In July, 648,000 were employed in the industry, compared with 560,000 in August, 1940, and with 503,000 in April of last year. Total payrolls of $112,757,000 were disbursed to steel company employees during August, as against $114,059,000 in July and $83,837,000 in August, 1940.

Wage-earning employees received an average of 98.5c. an hour in August, compared with 99.1c. in July and 85.1c. in August a year ago.

The number of hours worked per week by wage earners averaged 37.2 in August, which compares with 37.8 hr. per week in July and with 36.7 hr. per week in August, 1940.

Col. James B. Dillard Of Cleveland Is Dead

• • • **Col. James B. Dillard,** 59, general superintendent, Cleveland Twist Drill Co. and an authority on ordnance engineering, died Sept. 28 at Winton Place, Va. He was born in Norfolk, Va., April 22, 1882, and was graduated from West Point Academy in 1904. During the World War he was made chief engineer in the Ordnance Department, Washington. He resigned from the department in 1920 with the rank of Colonel and became associated with Cleveland Twist Drill Co. where he was general superintendent and a director. He was awarded the distinguished service medal in the World War.

He was a member of the National Metal Trades Association, A.S.M.E., S.A.E., A.S.M., Cleveland Engineering Society, Electrochemical Society, Army Ordnance Association, and the Cleveland Society of Professional Engineers.

He was a member of the Union Club and University Club of Cleveland and the Army and Navy Club of Washington.

Pig Iron Tonnage Sold on F.O.B. Basis

• • • **A small tonnage** of pig iron, allocated by OPM, was sold on an f.o.b. furnace basis in September, it was learned early this week. According to the terms of the pig iron price ceiling schedule, all pig iron is to be sold on the basis of the price at the basing point nearest the consumer, plus transportation charges to the point of consumption, or on a delivered price basis.

It is understood that the iron sold on an f.o.b. basis, which went to non-integrated steel mills, was shipped from a furnace outside the consumers' basing point areas and would have involved substantial freight absorption if sold on the strict interpretation of the iron price order. The sales were reported to be an isolated instance and it remains to be seen if they set a precedent.

It is known that OPA is currently studying the problem of freight absorption, but no official statement of the price agency's position is yet available.

The pig iron order, as issued, does not permit freight absorption on shipments outside the controlling basing point, while the steel order does permit it under certain conditions.

Pig iron producers contend that they should not be forced to absorb freight under such emergency allocations, while consumers are protesting the higher costs which would be involved and claim that in some instances iron is actually available nearer the consuming plant than that allocated by OPM.

Some trade observers are of the opinion that a possible solution to the problem is to permit an f.o.b. furnace basis on all allotments from the 2 per cent emergency pool, but requiring the usual practice to be followed in pricing regular orders.

Boston

• • • **The situation here** is a little more favorable this month due to a more liberal treatment of allotments of iron by the OPM for October. On the surface it appears as though the OPM, so far, has not held shipments strictly to priority ratings, but rather to levels in line with inventory standards.

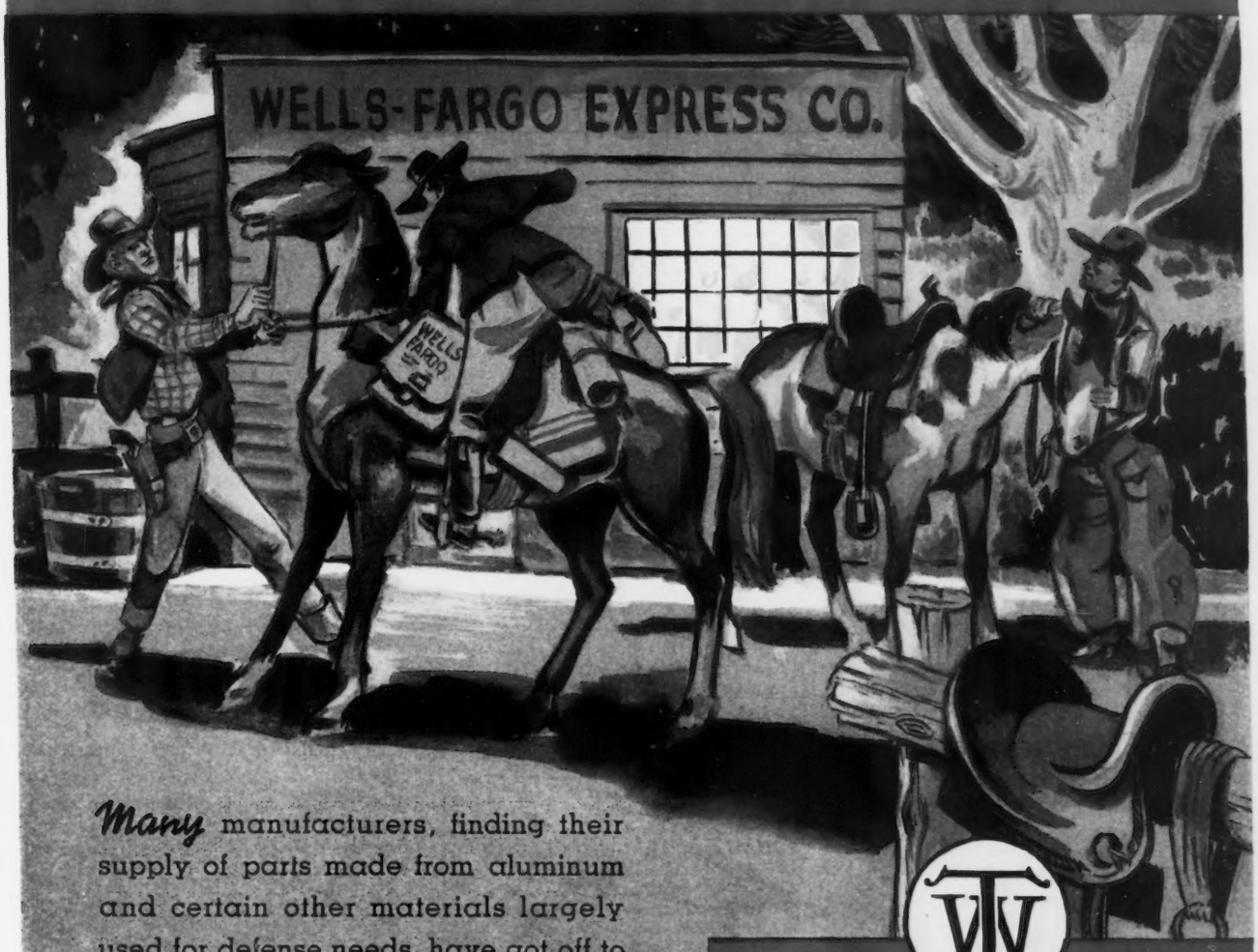
However, a troublesome situation appears certain in the not distant future. With inventories limited to a 30-day basis, which they eventually will be, there will come a time when melters will want more iron to keep plants operating at capacity through an established 30-day inventory period, whereas shipments at that time (probably on a strict priority basis) will be less than in the current month.

Ships Millionth Shell Case

• • • **Schwitzer-Cummins Co.**, Indianapolis, has delivered its 1,000,000th cartridge case produced here. The firm is manufacturing a variety of cartridge case sizes and shells in separate units of its plant.

A NECESSARY CHANGE

(IN HORSES OR METALS)



Many manufacturers, finding their supply of parts made from aluminum and certain other materials largely used for defense needs, have got off to a fresh start with a change to pressed steel. Transue has been successful in designing as well as producing steel stampings to meet the essential mechanical and physical requirements filled by the former parts or products. Actually, manufacturers in some cases have been amazed to discover improvements not previously accomplished. Why not let Transue's technically skilled, practically experienced personnel analyze your problem for a solution in pressed steel?

TRANSUE & WILLIAMS

Designers and Makers of Deep Drawn Stampings

SALES OFFICES: NEW YORK, PHILADELPHIA, CHICAGO, DETROIT, INDIANAPOLIS, CLEVELAND

Ford Begins to Lay Off 20,000

Detroit

• • • **Ford Motor Co.** this week began to lay off 20,000 employees of the Rouge plant as a direct result of curtailment of automobile production. Announcement of the payroll cut was made by Harry H. Bennett, Ford personnel director, shortly after the U.A.W.-C.I.O. had issued a statement about wage increases totaling $52,000,000 a year to be granted to Ford workers as a result of recent negotiations.

Large scale lay offs in the automobile industry have been predicted in the "Assembly Line" in recent months. Lay offs and transfer of men at Briggs have been responsible for recent strikes. In other plants employees who were temporarily out of work because of model change-over were not called back to work.

It is doubtful, according to the Ford official, that the workers can be called back to work until mass production workers are needed in the defense plants now under construction. The Ford bomber plant will absorb 60,000 men when in full production in spring of 1942. At present no defense material is in production in Ford plants in any large quantities except quarter-ton blitz buggies.

Bennett added the statement that the production line can no longer be kept operating at a loss and told an interviewer "It costs us twice as much to make an automobile as it did some time ago because of the slow downs and wildcat strikes from the time the U.A.W.-C.I.O. contract was signed."

U. S. Interests Seek to Outbid Reich for Portuguese Tungsten

• • • **The possibility** of obtaining at least a portion of the tungsten ore output of Portugal for importation to the United States is being studied by a group of American businessmen, it was learned early this week. Portugal is the largest European producer of tungsten ore, having mined close to 4000 tons of 60 per cent concentrates in 1939.

For the past several years the entire output of Portugal has been going to Germany, but the American interests hope to be able to outbid the Germans and acquire the tungsten. It is understood that prices are unusually high.

Steel Casting Panel Appointed by OPA

Washington

• • • **A new advisory** panel, consisting of 20 members of the carbon steel castings industry, was announced on Tuesday by OPA. A contemplated price schedule on carbon and low alloy steel castings was scheduled to be under discussion at a meeting of the panel and OPA officials on Wednesday.

Southwark-Tate-Emery Universal Testing Machine in the testing laboratory of Standard Steel Works, Burnham, Penna.

The materials going into Standard's forgings and castings are under the constant supervision of trained metallurgists. Their job is to safeguard the quality built into every part delivered to our customers.

A complete, modern testing laboratory is constantly engaged in research and routine tests for your protection.

Add trained shop personnel and up-to-date manufacturing equipment and you have the story behind the satisfactory service of materials made by Standard.

STANDARD STEEL WORKS

THE BALDWIN GROUP

Division of THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

Other Members of the Baldwin Group • THE BALDWIN LOCOMOTIVE WORKS
BALDWIN SOUTHWARK DIVISION • THE PELTON WATER WHEEL COMPANY
BALDWIN DE LA VERGNE SALES CORP. • THE WHITCOMB LOCOMOTIVE COMPANY
THE MIDVALE COMPANY • CRAMP BRASS AND IRON FOUNDRIES DIVISION

Government

Defense Plant Building:

Bell Aircraft Corp., Buffalo; plant and equipment for production of aircraft and parts	$8,456,175
Bullard Co., Bridgeport, Conn.; machinery and equipment for mfr. of machine tools	1,900,000
Curtiss-Wright Corp., Buffalo; enlarging of facilities for mfr. of airplanes	978,233
Fafnir Bearing Co., New Britain, Conn.; machinery and equipment for production of bearings	746,062
General Motors Corp., Aeroproducts Division, Detroit; machinery and equipment for production of aircraft propellers and parts	11,453,128
General Motors Corp., Chevrolet Division, Buffalo and Tonawanda, N. Y.; two plants and machinery and equipment for mfr. of aeronautical engines and parts	37,161,530
General Motors Corp., New Departure Division, Detroit; machinery and equipment for mfr. of aircraft bearings	2,442,355
Isolantite, Inc., Belleville, N. J.; new plant and equipment for production of ceramic products.	972,774
Parker Appliance Co., Cleveland; machinery and equipment for aircraft equipment production..	432,230
Reynolds Alloys Co., Lister Hill, Ala.; additional machinery and equipment for working of aluminum metal	2,796,079
Vickers, Inc., Detroit; machinery and equipment for production of hydraulic equipment for aircraft and artillery fire control	541,721
Warner & Swasey Co., Cleveland; machinery and equipment for mfr. of machine tools	550,000
Watson-Stillman Co., Roselle, N. J.; machinery and equipment for production of hydraulic equipment (increase to lease agreement of April 17)	214

War Dept., Ordnance:

Robert Abel, Inc., Boston; hoists, stationary	82,236
Accurate Tool Co., Newark; bases, punches, sleeves, etc.	3,441
Aetna-Standard Engineering Co., Youngstown, Ohio; assemblies..	15,000
Affiliated Machine & Tool Co., New York; gages	6,103
Ajax Electrothermic Corp., Trenton, N. J.; melting equipment ..	49,905
Alexander & Cox Co., Chicago; gaskets & washers	1,580
All Tool Co., Hillside, N. J.; adapters, punches, pins, etc.	3,325
Allegheny Ludlum Steel Corp., Pittsburgh; plates, heat treating suspension device	15,022
steel	1,666
gages	1,700
Allis-Chalmers Mfg. Co., Milwaukee; parts for tractors	30,200
American Brass Co., Waterbury, Conn.; copper rod	3,818
American Car & Foundry Co., New York; mechanisms, firing	3,628
parts for tanks	216,732
American Foundry Equipment Co., Mishawaka, Ind.; parts for wheelabrator	1,542
American Gas Furnace Co., Elizabeth, N. J.; parts for furnace ..	1,315
American Thermometer Co., St. Louis; boosters	980,000
American Type Founders Sales Corp., New York; screens, lamp, plates, etc.	7,120
Anchor Post Fence Co., Baltimore; ammunition trays	14,947
Dorsey C. Anderson, Philadelphia; electric welders	1,244

Awards . . .

Apex Tool & Cutter Co., Inc., Shelton, Conn.; tool bits 1,365
Arguto Oilless Bearing Co., Philadelphia; punches & dies 9,222
G. R. Armstrong Mfrs. Supplies, Inc., Boston; bolts, lockwashers, etc. 1,148
Arrow Tool & Reamer Co., Detroit; tools, cutting 2,025
Atlas Mfg. Co., New York; spare parts for machine guns 1,001
Atwood Vacuum Machine Co., Rockford, Ill.; parts for tanks.. 14,075
Barber-Colman Co., Rockford, Ill.; machines, sharpening 8,146
machines, hobbing 14,892
gear hobs 3,120
Barker Tool Die & Gauge Co., Detroit; gages 1,363
Barnes Drill Co., Rockford, Ill.; machines, honing 17,325
Barnes Mfg. Co., Mansfield, Ohio; castings, bronze 31,429
Bay Products Corp., Boston; tools, carbon removing 79,887
Bay State Abrasive Products Co., Westboro, Mass.; grinding wheels 1,545
Benrus Watch Co., Waterbury, Conn.; screws, arbors, pinions, etc. 210,687
Boote-Burt Machine Co., Cleveland; grinders 3,753
Borg-Warner Corp., Rockford Drilling Machine Division, Rockford, Ill.; parts for overhaul of tanks 159,579
assys., clutch plate 7,650
Boyt-Harness Co., Des Moines, Iowa; parts for tanks 7,268
Brass & Copper Sales Co., St. Louis; brass, half hard bar; & sheets, brass 1,800
brass 5,102
Breeze Corps., Inc., Newark; block assemblies 7,235
Bridge Tool & Die Works, Philadelphia; punches & spindles ... 6,390
Bridgeport Brass Co., Bridgeport, Conn.; seamless tubing 30,084
E. G. Budd Mfg. Co., Philadelphia; bombs 765,860
Burroughs Adding Machine Co., Davenport, Iowa; adding & listing machines 1,985
Bushman Motor Works, Lincoln, Neb.; metal parts 219,000
Byers Office Equipment Co., Davenport, Iowa; steel chairs 1,190
C. & B. Machine Co., New Haven, Conn.; gages 3,120
Carboloy Co., Inc., Detroit; reamers 1,261
Carnegie-Illinois Steel Corp., Chicago; steel 12,564
H. Channon Co., Chicago; trucks, warehouse 1,540
Chase Brass & Copper Co., Waterbury, Conn.; bar, brass 1,718
C. B. Christiansen, Newark; fixtures, springs, plates, etc. 5,175
holders, punches, jaws, etc. 3,000
Chrysler Corp., Detroit; shells ... 312,000
Cincinnati Ball Crank Co., Cincinnati; burster casings 8,671
Cincinnati Electrical Tool Co., Cincinnati; grinders, pedestal .. 414
Cincinnati Milling Machine Co., Cincinnati; milling machines & grinders 6,996
parts for milling machines 1,605
Circle Wire & Cable Corp., Long Island City, N. Y.; cable 3,345
Clark Equipment Co., Clark Tructractor Division, Battle Creek, Mich.; ship mules & trucks ... 8,672
Clark Tructractor, Battle Creek, Mich.; trucks 5,158
Cleveland Twist Drill Co., Cleveland; drills & reamers 1,497
steel 1,090
Climax Engineering Co., Clinton, Iowa; assemblies, oil pump ... 16,821
bodies, oil pump 1,762

Colt's Patent Fire Arms Mfg. Co., Hartford; machine gun & automatic pistol parts 5,888
automatic pistols 1,760
Continental Motors Corp., Muskegon, Mich.; parts for light tanks, priming parts & ceramic plugs. 17,762
parts for tanks 3,130
Cooper Mfg. Co., Inc., Marshalltown, Iowa; gaskets 1,502
Crescent Insulated Wire & Cable Co., Trenton, N. J.; cable 1,257
Crittall-Federal, Inc., Waukesha, Wis.; steel, fabricated 4,583
Crucible Steel Co. of America, New York; steel, nickel-chromium .. 2,662
steel 1,998
Dana Tool-D Nast Machinery Co., Philadelphia; taps, drills, saws & blades 1,007
tools 1,574
Davis Tool & Equipment Co., Inc., Chicago; taps 1,289
Derbyshire Machine & Tool Co., Philadelphia; rings, inner bearing 1,280
Dings Magnetic Separator Co., Milwaukee; magnetic separator ... 2,850
Henry Disston & Sons, Inc., Philadelphia; files 2,008
Eagle Electric Supply Co., Inc., Boston; cable 2,725
Edgcomb Steel Co., Philadelphia; forgings, tool steel 2,481

Electric Auto-Lite Co., Toledo, Ohio; generators & regulators .. 16,436
R. E. Ellis Engineering Co., Chicago; reamers 2,015
Engineering Tool Co., Philadelphia; assemblies & bands 4,125
filler rings 1,560
Ex-Cell-O Corp., Detroit; drilling machines 7,411
Federal Products Corp., Providence; gages 1,585
Fidelity Machine Co., Philadelphia; machines 3,500
A. Finkl & Sons Co., Chicago; blocks, die, steel 4,057
Flannery Bolt Co., Bridgeville, Pa.; plugs, closing 9,490
Fox Munition Corp., Philadelphia; gages 1,141
Franklin Electric Co., Philadelphia; wire & outlet boxes 1,333
Freeport Machine Works, Inc., Freeport, Ill.; machines, babbitting 857
parts for tanks 1,880
General Machine Co., Newark; blending equipment 80,390
Gisholt Machine Co., Madison, Wis.; machines, balancing 9,750
Goddard & Goddard Co., Inc., Detroit; cutters, milling 1,728
Great Lakes Steel Corp., Detroit; sheets, steel 1,598
Greenfield Tap & Die Corp., Greenfield, Mass.; gages 13,167
Hamilton Metal Products Co., Hamilton, Ohio; steel chests 10,539
Handy & Harman, New York; services to re-roll scrap silver into sheets 1,203
Hanson Whitney Machine Co., Hartford; taps, hand metric .. 1,192
Louis Hanssens Sons, Davenport, Iowa; bolts, handles, hooks, etc. 1,181
M. Hertzberg & Son, Inc., New York; brushes 2,433
Hobart Brothers Co., Troy, Ohio; generating unit 2,800
Hygrade Products Co., Inc., Long Island City, N. Y.; delay holders 2,805
Illinois Tool Works, Chicago; cutters 1,050
Imperial Electric Supply Co., Brooklyn; cable 1,075
International Harvester Co., Inc., Chicago; parts for heavy tractors 84,700
Ithaca Gun Co., Inc., Ithaca, N. Y.; shot guns 27,984
JCH Automatic Machine Works, Philadelphia; die supports 1,035
Jeffrey Mfg. Co., Boston; idler, sheaves, & sheave chains 1,309
Johnson-Claflin Corp., Marlboro, Mass.; gages 1,072
Jones & Lamson Machine Co., Springfield, Vt.; parts for turret lathes 1,577
Jones & Laughlin Steel Corp., Pittsburgh; rod, steel 6,070
Kaufman Mfg. Co., Manitowoc, Wis.; machines, tapping 4,923
Keenan Supply Co., Philadelphia; conveyors, tube 1,090
Kingston Products Corp., Kokomo, Ind.; shells 76,348
H. R. Krueger & Co., Detroit; chambering machines 40,360
drilling machines 6,384
Lamson Corp., Syracuse, N. Y.; conveying units 1,748
La Salle Steel Co., Chicago; steel. 9,229
F. H. Lawson Co., Cincinnati; galvanized containers 1,179
Leach Co., Oshkosh, Wis.; assemblies 23,182
Leitelt Brothers, Chicago; castings, bronze 1,444
Lincoln Mfg. Co., Chicago; screws & pins 4,633
Lipe Gear Co., Buffalo; forgings, drop 2,345
Lloyd & Arms, Philadelphia; lathes 4,548
Magnus Tool & Die Co., Newark; guides, punches, bases, anvils, 28,953

Manning, Maxwell & Moore, Shaw-Box Crane & Hoist Division, Muskegon, Mich.; assemblies, trolley drive wheel 4,981
Martin-Parry Corp., York, Pa.; assemblies 1,961
Mattatuck Mfg. Co., Waterbury, Conn.; set-back pins 13,350
May Co., Moline, Ill.; wrought iron pipe 1,144
Mechanical Laboratories, Inc., Pittsburgh; gages 1,084
Michigan Seamless Tube Co., South Lyon, Mich.; tubing, seamless steel 3,676
Midvale Co., Philadelphia; steel.. 1,510
Miller Co., Meriden, Conn.; brass strip 1,182
Miller Printing Machinery Co., Pittsburgh; parts for tanks ... 14,832
Minneapolis-Moline Power Implement Co., Minneapolis; parts, misc., latch, pins, ferrule, spacers, shaft, etc. 5,438
Modern Machine Corp., Brooklyn; gages 1,922
Modern Tool & Die Co., Philadelphia; gages 1,132
Molded Insulation Co., Philadelphia; receptacles 2,535
National Acme Co., Cleveland; screw machines 25,407
National Copper & Smelting Co., Cleveland; tubing, brass, seamless 1,797
National Screw & Mfg. Co., Cleveland; screws, wood 10,575
New Haven Sandblast Co., New Haven, Conn.; barrels 1,829
New Jersey Machine Corp., Hoboken, N. J.; tables, lens polishing 4,880
Nicholson File Co., Providence; files, mill 2,309
Noble & Westbrook Mfg. Co., East Hartford; marking machines .. 5,550
Northern Sales Co., Philadelphia; screws & files 1,694
Norton Co., Worcester, Mass.; grinders 5,804
L. Offerman Tool & Die Co., New York; gages 1,633
Oliver Farm Equipment Co., Charles City, Iowa; gasoline tanks 5,479
Olsen, Tinius, Testing Machine Co., Philadelphia; presses 4,445
Otis Elevator Co., Buffalo; steel castings 2,693
Otis Steel Co., Cleveland; steel plates 1,464
steel 2,809
Parsons Co., Detroit; land mines. 606,040
Philadelphia Bronze & Brass Corp., Philadelphia; manganese bronze 7,684
Pickands Mather & Co., Chicago; pig iron 1,296
Pratt & Letchworth Co., Inc., Buffalo; steel castings 3,256
Producto Machine Co., Bridgeport, Conn.; cutters, fly 3,744
Progress Tool & Engineering Co., New York; gages 1,247
Putnam Tool Co., Detroit; end mills & reamers 10,095
Quality Tool & Die Co., New York; gages 10,315
RCA Mfg. Co., Inc., Camden, N. J.; lathe with equipment 54,243
A. B. & J. Rathbone, Palmer, Mass.; steel, cold drawn 6,109
Reasoner Tool & Supply Co., Boston; twist drills 1,126
Red Jacket Mfg. Co., Davenport, Iowa; gray iron castings 1,981
Niles-Bement-Pond Co., Pratt & Whitney Division, West Hartford; machines, drilling, reaming & rifling 688,900
drill points 3,250
parts for gages 12,874
files 3,463
Reliable Tool Co., Irvington, N. J.; tools 9,343
Republic Steel Corp., Cleveland; steel, carbon 1,859
steel, molybdenum 1,562
barrel blanks 66,894
Revere Copper & Brass, Inc., Rome Mfg. Co. Division, Rome, N. Y.; plunger bodies 21,930
Reynolds Metals Co., Louisville, Ky.; aluminum strip 3,394
Ritter Pattern & Casting Co., Inc., New York; steel castings 5,539
Rockford Automatic Screw Co., Inc., Rockford, Ill.; parts for tanks 1,081
John A. Roebling's Sons Co., Trenton, N. J.; wire, music, for mechanical time fuze 2,438
Roessler Machine Co., Philadelphia; punches 15,244
Russell Mfg. Co., Middletown, Conn.; ammunition belts 282,600
Rustless Iron & Steel Corp., Baltimore; cold drawn steel 38,059
steel 2,653
Saginaw Stamping & Tool Co., Saginaw, Mich.; parts, for rack on bomb trailer 16,146
Scovill Mfg. Co., Waterbury, Conn.; pins, latch clip 2,880
fuzes 825,000
Sheffield Corp., Dayton, Ohio; multicheks 638,035
gages 6,516
Simonds Saw & Steel Co., Fitchburg, Mass.; plates, homogeneous armor 1,412

GOVERNMENT AWARDS

Smith & Mills Co., Cincinnati; tools, machine, & equipment .. 39,930
Spicer Mfg. Corp., Toledo, Ohio; covers, oil, pump body for transmission 1,237
Stamford Rolling Mills Co., Springdale, Conn.; disks, cartridge brass 70,883
Standard Gage Co., Poughkeepsie, N. Y.; gages 3,566
Standard Machinery Corp., Providence; steel roller bearings 1,940
Standard Pressed Steel Co., Jenkintown, Pa.; cores, hardening steel 2,060
Standard Spring & Mfg. Co., Brooklyn; parts for gun carriages 8,498
F. J. Stokes Machine Co., Philadelphia; holders, upper & lower punch 1,910
Taft-Peirce Mfg. Co., Woonsocket, R. I.; gages 1,547
Talon, Inc., Meadville, Pa.; gages 8,875
Taylor & Fenn Co., Hartford; vertical milling machines 82,560
Taylor-Wharton Iron & Steel Co., Easton, Pa.; shells 826,000
Timken-Detroit Axle Co., Wisconsin Axle Division, Detroit; gears for tanks 1,715
parts for tanks 9,056
Tools & Gages, Inc., Cleveland; gages 4,278
Tube-Turns, Inc., Louisville, Ky.; shells 1,970,000
Union Twist Drill Co., Athol, Mass.; tools, cutting & drills .. 5,042
reamers, mills and arbors 1,813
cutters 5,152
Unique Specialties, Inc., New York; sockets, sleeves, covers, etc. 17,303
punches, pellet staking 1,816
United Shoe Machinery Corp., Boston; design & construction of shell ramming & fuze setting device 50,000
United States Pipe & Foundry Co., Burlington, N. J.; projectiles & presses 163,845
Universal Castings Corp., Chicago; castings, aluminum bronze 2,002
Veit & Young, Philadelphia; punches & ejecting stems 16,170
stems, pocket ejecting 30,960
John Verduin Machine Corp., Paterson, N. J.; presses 136,800
Victor Mfg. & Gasket Co., Chicago; gaskets & washers 2,402
Waldorf Mechanical Laboratories, Inc., New York; gages 5,780
Wallace & Tiernan Co., Inc., Newark; automatic chlorinating system 2,225
Warner Electric Brake Mfg. Co., Beloit, Wis.; cables, jumper ... 6,138
Waterbury Clock Co., Waterbury, Conn.; fuzes 2,557,500
Weldon Tool Co., Philadelphia; counterbores 1,650
S. K. Wellman Co., Cleveland; steel rivets 2,048
Western Cartridge Co., East Alton, Ill.; skeet outfits 14,700
Western Cartridge Co., Winchester Repeating Arms Co. Division, New Haven, Conn.; shot guns .. 130,587
Westinghouse Elec. & Mfg. Co., Newark; conveyor belt, complete with drive shaft assembly. 2,060
motors, induction 41,344
Westinghouse Electric Supply Co., Wetmore-Savage Division, Boston; cable 3,212
Wiederholt & Hubbard, Inc., New York; gages 1,104
Wiedemann Machine Co., Philadelphia; cupping bushings, die holders & filler rings 1,287
gages 1,727
Winslow Mfg. Co., Stamford, Conn.; dies 1,950
Alan Wood Steel Co., Conshohocken, Pa.; steel 1,318

GOVERNMENT AWARDS

Wyckoff Drawn Steel Co., Chicago; steel, carbon 1,714
steel bar 11,017
steel 5,443
Youngstown Sheet & Tube Co., Youngstown, Ohio; sheets, steel 1,884
Zipit Corp., Philadelphia; gages.. 1,315

War Dept., Air Corps:

Aeroquip Corp., Jackson, Mich.; hose assemblies $2,860
American Brass Co., American Metal Hose Branch, Waterbury, Conn.; flexible conduit 58,511
Anchor Coupling Co., Inc., Waukegan, Ill.; hose assemblies 54,167
Bell Aircraft Corp., Buffalo; gun mount adapters 522,632
Bendix Aviation Corp., Bendix Products Division, South Bend, Ind.; carburetor assemblies 224,596
Consolidated Aircraft Corp., San Diego, Cal.; engine parts 4,003,940
Douglas Aircraft Co., Inc., Santa Monica, Cal.; airplanes & spare parts 6,061,385
Fairchild Engine & Airplane Corp., Long Island City, N. Y.; engine parts 207,988
J. A. Fay & Egan Co., Cincinnati; wood-working machinery 64,250
Flex-o-Tube Co., Detroit; hose assemblies 8,877
Ford Motor Co., Dearborn, Mich.; airplanes and spare parts 231,742,500
Fyr-Fyter Co., Dayton, Ohio; fire extinguishers 139,397
General Motors Corp., Allison Division, Indianapolis; engine parts. 8,197,051
C. H. Gosiger Machinery Co., Dayton, Ohio; wood-working machinery 8,991
Earle Hart Woodworking Machine Co., Chicago; wood-working machinery 102,195
E. A. Kinsey Co., Cincinnati; horizontal milling machines 50,455
Lamson & Sessions Co., Cleveland; cotter pins 90,552
Aleck Leitman, Aita Lite Mfg. Co., New York; target assemblies .. 27,379
Lunkenheimer Co., Cincinnati; drain cocks 22,437
Oliver Machinery Co., Grand Rapids, Mich.; wood-working machinery 17,896
Osborne & Sexton Machinery Co., Columbus, Ohio; wood-working machinery 108,760
L. Power & Co., Philadelphia; wood-working machinery 23,800
Service Tool & Engineering Co., Dayton, Ohio; sight assemblies.. 383,520
R. D. Sheldon Co., Cincinnati; wood-working machinery 24,650
Vultee Aircraft, Inc., Vultee Field Division, Downey, Cal.; airframe spares 1,044,400
Weatherhead Co., Cleveland; drain cocks 40,195
S. Weinstein Supply Co., New York; wood-working machinery. 11,440
Yale & Towne Mfg. Co., Stamford, Conn.; pumps, fuel transfer, power driven 50,995
Yates American Machine Co., Beloit, Wis.; wood-working machinery 222,879

War Dept., Quartermaster Corps:

Allen Boat Co., Inc., Harvey, La.; steel barges $130,000
Autocar Co., Ardmore, Pa.; tractor trucks, 4-5 ton 453,900
V. Barletta Co., Roslindale, Mass.; pipe line & appurtenances from Pemberton to Fort Warren, Mass. 193,350
Belknap Hardware & Manufacturing Co., Inc., Louisville, Ky.; tool kits, carpenters' & wheelwrights' 896
Chicago Tool & Kit Mfg. Co., Chicago; 180,000 ea. parts for field ranges 732

GOVERNMENT AWARDS

John P. Daleiden Co., Chicago; bread plates, aluminum 1,170
Equitable Equipment Co., New Orleans; steel barges 266,400
Ford Motor Co., Dearborn, Mich.; tractor trucks, 1½ ton 210,990
General Motors Corp., Chevrolet Division, Flint, Mich.; cars, 5-passenger, light sedan 269,388
trucks, ½ ton 195,021
General Excavator Co., Marion, Ohio; crawler cranes 34,120
Hall Scott Motor Car Co., Newark; engines 465,654
Morton Johnson & Co., Bayhead, N. J.; seabright dories 5,060
Edward Katzinger Co., Chicago; 17,205 sets, pan, bread 19,645
Lafayette Iron Works, Inc., Jersey City; erection of steel columns & roof members in shipping & packing building, Raritan Arsenal, N. J. 6,970
C. Ralph Leland, Baltimore; construction of ordnance repair shop with 10-ton crane, Fort George G. Meade, Md. 31,580
Lockwood Mfg. Co., Cincinnati, Ohio; 17,795 sets, pans, bread, strapped, one pound 19,031
Millers Falls Co., Greenfield, Mass.; tool kits, carpenters' & wheelwrights' 1,878
National Enameling & Stamping Co., Granite City, Ill.; pans, dish 472
Newport News Shipbuilding & Drydock Co., Newport News, Va.; bronze propellers 15,300
O'Driscoll & Grove, Inc., New York; motor repair shops, including ten shops, four grease racks, four oil houses, four wash racks and maintenance facilities, Fort Dix, N. J. 594,000
Peck Stow & Wilcox Co., Southington, Conn.; tool kits, carpenters' & wheelwrights' 570
Perry Construction Co., Philadelphia, Miss.; motor shops, grease & inspection racks, oil houses & concrete wash racks, Camp Shelby, Miss. 640,000
Red Bank Marine Works, Red Bank, N. J.; seabright dories .. 5,250
Spetnagel Hardware Co., Chillicothe, Ohio; tool kits, carpenters' & wheelwrights' 246
forges, portable 6,794
Sturgeon Bay Shipbuilding & Dry Dock Co., Sturgeon Bay, Wis.; retrieving vessels 1,215,000
Union Hardware Co., Torrington, Conn.; tool kits, carpenters' & wheelwrights' 572
Walters & Prater, Morristown, Tenn., and **Mark K. Wilson**, Chattanooga, Tenn.; additional construction at Memphis Quartermaster Depot 1,198,000
Yellow Truck & Coach Mfg. Co., Pontiac, Mich.; trucks, 2½ ton, 6 x 6, cargo & tank 36,936,055

War Dept., Signal Corps:

American Automatic Electric Sales Co., Chicago; braces, washers & screws $28,337
H. M. Cornelius Co., New York; tool equipment 1,461
Eital-McCullough, Inc., San Bruno, Cal.; valves 1,350
Electrical Mfg. Co., Battle Creek, Mich.; anchor rods 78,000
Graybar Electric Co., Chicago; sleeves, tools & insulators 39,730
Harvard Lock Co. of New York, Inc., New York; mountings..... 795
Hubbard & Co., Cicero, Ill.; insulator pins 28,600
Igoe Brothers, Inc., Brooklyn; nails 791
Joslyn Co., New York; brackets & carriage bolts 12,275
Karp Metal Products Co. Inc., Brooklyn; boxes 8,243

GOVERNMENT AWARDS

Leich Sales Corp., Chicago; wire.. 31,172
Locke Insulator Corp., Chicago; washers 4,325
Rome Cable Corp., Rome, N. Y.; Wire 393,745
Seyler Mfg. Co., Pittsburgh; machine bolts 11,912
Westinghouse Electric Supply Co., Chicago; shovels, spoons, bars, poles & climbers 5,538

War Dept., Corps of Engineers:

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; hydraulic forcing presses, Aircraft Assembly Plant, Ft. Worth, Tex. $3,801
Briggs-Weaver Machinery Co., Dallas; tool & cutter grinders, Aircraft Assembly Plant, Ft. Worth, Tex. 2,797
metal shapers, Aircraft Assembly Plant 11,740
Chicago Pneumatic Tool Co., Los Angeles; rotary air drills, Aircraft Assembly Plant, Ft. Worth, Tex. 2,750
riveters, Aircraft Assembly Plant 93,875
air screw drivers, Aircraft Assembly Plant 3,400
Hart Industrial Supply Co., Oklahoma City; bench lathes, Aircraft Assembly Plant, Tulsa, Okla. .. 3,864
Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio; vacuum cleaners, Aircraft Assembly Plant, Ft. Worth, Tex. 3,982
Kearney & Trecker Corp., Milwaukee; milling machines, Aircraft Assembly Plant, Tulsa, Okla. ... 19,157
Lincoln Electric Co., Tulsa, Okla.; portable electric welders, Aircraft Assembly Plant, Tulsa, Okla. 2,806
Machinery Sales & Supply Co., Dallas; hydraulic surface grinders, Aircraft Assembly Plant, Ft. Worth, Tex. 6,072
hand screw machines, Aircraft Assembly Plant 3,661
Marshall Supply & Equipment Co., Tulsa, Okla.; heavy duty gap lathes & accessories, Aircraft Assembly Plant, Ft. Worth, Tex. 10,640
McArdle Equipment Co., Houston, Tex.; contour saw & filing machines, Aircraft Assembly Plant, Ft. Worth, Tex. 4,074
Parker Appliance Co., Cleveland; hydraulic tube benders, Aircraft Assembly Plant, Ft. Worth, Tex. 4,799
L. L. Ridgway Co., Tulsa, Okla.; drafting tables, Aircraft Assembly Plant, Tulsa, Okla. 2,242
Southwest Industrial Equipment Co., Dallas; steel work benches, Aircraft Assembly Plant, Tulsa, Okla. 17,948
Texas & Pacific Railway Co., Dallas; railway trackage, Aircraft Assembly Plant, Ft. Worth, Tex. 65,000
Well Machinery & Supply Co., Fort Worth, Tex.; double end benches & grinders, Aircraft Assembly Plant, Ft. Worth, Tex. 2,325
Wylie-Stewart Machinery Co., Oklahoma City; Universal motocranes, Aircraft Assembly Plant, Tulsa, Okla. 12,360

War Dept., Medical:

Ervin & Co., Philadelphia; sterilizers, hot air & test tube supports $5,647
Harris-Hubb Bed & Spring Co., Cicero, Ill.; desks, steel 7,500
Harrisburg Steel Corp., Harrisburg, Pa.; cylinders 2,712
Oneida Ltd., Oneida, N. Y.; forceps 108,500
Penn Surgical Mfg. Co. Inc., Philadelphia; scissors 4,744
Ransom & Randolph Co., Toledo, Ohio; round burs 505
Superior Sleeprite Corp., Chicago; dressers, steel 20,100
Taylor-Wharton Iron & Steel Co., Easton, Pa.; cylinders, seamless 13,399

Plaster Molds

(CONTINUED FROM PAGE 78)

grid expands and the mold contracts the movement is lengthwise along the grid bars, thus eliminating the normal shearing action. Three of the arms of the grid are supported on the conveyor proper by means of a sleeve which permits the grid to expand freely through these sleeves, eliminating distortion of the grid during the expansion.

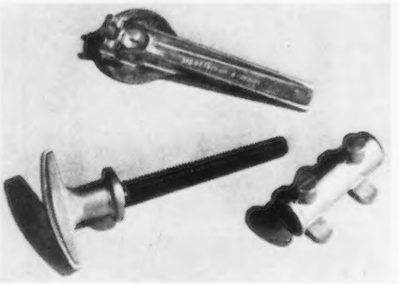
The entire preparation of the mold, from the primary material mixing point to the exit end of the oven requires about 2 hr., with the installation designed to process 60 mold units an hour.

After baking, the molds are inspected, cores and inserts are added, and cope and drag mated. Cores are made in a separate department by the same method involved in making the molds. In this mating process, any cope of a given batch of molds will fit any drag of a similar batch. After closure, the assembled mold is placed on a pouring stand and passes to the pouring department via overhead crane.

The pouring stand (see illustration) employed at the Briggs plant was developed by that company and the inventor of the Capaco process. It is somewhat different from the usual non-ferrous practice and deserves particular attention. The stand is a structural assembly mounted on four wheels and will hold 12 completed molds which are clamped into place by a hand screw. Each head clamp (one for each mold) consists of a hollow pad covering the surface of the mold and is water cooled to permit continuous use of the stand.

When the stand is in a pouring

° ° °



ALUMINUM parts cast in plaster molds, including part with a mild steel threaded insert.

position, hydraulic rams mounted in the floor rise beneath each mold and in addition to clamping the mold firmly, tilt the entire assembly about five degrees from the vertical. This tilting, with the gate end down, is designed to cause the metal to run uphill into the mold. An asbestos tube, inserted in the gate hole of the mold, serves as the sprue. This pouring tube consists of a sheet of asbestos of two or three thicknesses rolled into the tube, giving a diameter of about 1½ in., and stapled. The wall thickness of the two thicknesses is about one-sixteenth of an inch. The height of the pouring tube can be adjusted to provide any hydrostatic head required. Usual practice is to have the tube about seven inches high which gives a head of about two pounds.

As indicated in the photograph, the entire pouring stand can be removed as one unit. Thus, after pouring, the hydraulic rams are slacked off, the tube gate removed by simply breaking off (before the metal in the head becomes cold, but after the mold proper has solidified) and the stand rolled from the pouring position. A hoist elevates the entire stand up to the second floor where the molds are shaken out.

In most instances, the entire gate, including the runners, will break off the castings during the shakeout. Where this does not occur, band saws are utilized for gate removal. As the castings leave the mold during shakeout, their surfaces are quite free of plaster adhesions, except for cored or indented sections. Plaster is removed from these areas by passing the castings through a chamber where high pressure water streams play on the castings.

Serious consideration is being given to the possibility of reusing plaster material back through the molding process; also some other salvage forms are being studied. However, for the time being, used material is simply being discarded.

From this point on, the castings are handled in the usual manner except that no further cleaning operations are performed and only a slight amount of trimming of gates and parting lines is necessary before shipment. The amount of sur-

face finishing required is comparable to that in die castings.

An important component of the Capaco system, the point where the high accuracy of its castings begins, is the pattern and mold section. The pattern and what would commonly be called the snap flask are one piece and are never separated except when patterns are being changed.

The combined pattern and flask are called a die pattern which is divided into 20 equal sections to give greater flexibility of production. A pattern may occupy any number of these subdivisions from 1 up to 20. When a run of a given pattern is completed, it is possible to remove the one pattern by removing the division or divisions it occupies and substituting a new one, or simply substituting a flat block if no new pattern is to replace the one removed.

External dimensions of the die patterns are standardized at 12 in. wide by 18 in. long, with the internal, or pattern area, being 17½ in. by 11½ in. Each division or unit measures 1¾ in. by 5 7/16 in. which leaves an area through the center of the mold for gating.

Bottom plates of the pattern are of normalized Meehanite for trueness and strength. The unit sections are machined to a tolerance of plus 0.00025 in., minus 0. There is some play between the units when cold, but at working temperature (160 deg. F.) the expansion of the metal gives a tight fit. Draft of the flask sides is ⅛ in. in 3 in. Shrink allowances are generally slightly greater than with sand practice, depending upon the alloy used. The sides of the forms or die patterns are machined vertically for greater ease of extraction of the mold. The general construction of the die pattern is quite similar to that of a sand cast match plate. However, it has accuracies equal to those of a die casting.

Design practice at Briggs in plaster mold production is to work with casting tolerances of ± 0.002 in. per linear inch. Across parting lines, a tolerance of ± 0.004 in. is regularly followed. Wall thickness can also be kept quite thin. In cases where the wall area does not exceed 2 sq in., a thickness of 0.04 in. can be cast. Where larger areas are concerned, the commercially

possible wall thickness runs roughly 0.0625 in. in castings of wall areas of 4 to 6 sq. in. while with wall areas up to 40 sq. in., a thickness of 0.093 in. is possible.

The words commercial tolerance are used here to indicate tolerances reproducible on a production scale, as compared with pilot or experimental work. While much closer tolerances than those noted here are possible in experimental runs, the commercial, or production, runs are of more importance in appraising the possibilities of the process.

The flatness of surface which can be achieved depends largely upon the shape of the casting and the distribution of its mass. Generally speaking, however, areas of about one sq. in. can be held flat to within 0.001 in. while with a surface area of around six sq. in., warpage would be between 0.002 and .015 in., depending upon the casting design. On drafts, a taper of 0.004 in. to 0.005 in. per side, per linear inch, can be used without difficulty.

The output of a pattern per day varies with the number of unit strips covered by the pattern, or to put it another way, with the number of castings which will fit in a mold. A one impression pattern will produce 32 pieces per eight-hour day, or two impressions will turn out 64 pieces, etc. The turn over per mold is four times an hour. Thus a pattern with 10 impressions will give a production of 320 pieces per eight-hour day.

The amount of plaster required over the pattern varies considerably from casting to casting. In instances where a portion of the casting protrudes above the body of the casting, it is possible to carry ¼ in. of mold material top and bottom although it is desirable to have more coverage. The ideal coverage would be about a minimum of ⅜ to ½ in.

Working with a mold material which to all effects contains no moisture and one which is so porous as to eliminate completely the need for venting, opens up a new avenue in pouring technique. The men at Briggs refer to the pouring of a Capaco casting as a semi-forging operation. The theory lying behind this view is: A small globule of metal is introduced into the mold and this globule is slowly expanded by addition of metal from the head

until it fills the entire mold. It is their contention that oxides formed on the surface of the globule remain on the surface and are not entrained in the metal.

As the globule expands to fill the mold passage, it is squeezed forward, with the surface oxides brought in contact with the walls of the cavity and held there. Touching the wall chills the metal, causing a slight solidification and consequently immobilizes the oxides along the wall surface.

The tilting of the mold (by tilting the pouring stand) forces the metal to run uphill and this is claimed to permit better control of the progress of the pouring. The speed of pouring is controlled by the dimensions of the orifices on the gate leading to each mold cavity, rather than by the speed with which the air and steam generated in a mold can be expelled. The layout of the mold is such as to introduce the metal into the mold at the lowest point of the casting. This practice, together with the use of the gate entrance as a controlling medium reduces turbulence considerably. The design of the head and the height of the pouring tube are such as to provide a pressure of around 2½ to 3 lb. per sq. in. upon the metal at the highest point of a mold cavity.

The major portion of the mold is placed in the cope and little difference in surface appearance of the casting is found between the cope and drag surfaces. Shrink bobs are employed in usual fashion. The size of the orifice varies with the size of the casting, but a rule of thumb developed over a period of time is that the cross sectional area of the orifice should be about 0.0007 sq. in. for each ounce of casting weight when working in yellow brasses. An indication of the relationship between the feeder and the casting proper is that in a typical mold which contained 35½ lb. of metal, 27 lb. represented the casting and 8½ lb. were feeders.

The competitive position of the Capaco process in the highly competitive casting field is somewhat difficult to determine under today's market conditions. This much is certain, however, that industries representing tremendous potentialities are making use of these castings on an ever widening scale.

It appears at the moment that rather than eating into the field

of any existing method of casting, the process will find its biggest customers in fields not now open to castings. Typical of this is the recent decision of a large electrical manufacturer to make use of a complicated switch assembly cast in one piece in Capaco molds in beryllium copper. Previously this assembly consisted of a cast base to which were attached a number of mild steel welded parts. The ability to cast this intricate piece to the close tolerances demanded in electrical work and to eliminate further machining operations were factors in causing the substitution.

It is probable, however, that there will be some overlapping of the Capaco process and die casting when more competitive conditions return. At the moment, the output of Capaco castings is limited to pieces which will fit into the standard flask (12 x 18 in.) but experiments are underway to permit the casting of much larger pieces.

Capaco castings are normally sold on a per piece basis rather than on a pound basis. Thus while the average casting is more expensive than the comparable sand casting, when converted to a cost per pound, the fact that further machining is not required tends to lower the ultimate cost and improve the competitive position of the Capaco piece.

The ultimate scope of the process —the metals which may be cast and the maximum sizes and weights of castings which can be handled—is not yet fully known. One airplane company experimented with certain plaster-cast aluminum castings, but finally decided not to change from sand castings. On the other hand, other aircraft companies are making extensive use of Capaco castings. The defense program is also utilizing Capaco castings, one large job having been recently awarded for a shell part. Electrical, auto, aircraft, and practically all metal working industries producing all sorts of household machinery and many varieties of small industrial devices, gages and the like, are among present users or prospective users of these castings.

The bulk of the castings being turned out at present in Capaco molds are brass but other types of alloys can be successfully worked. To quote Henry Hagemeyer, president of Castings Patent Corp., "It is possible with the Capaco process

to use alloys of practically no elongation, Brinell of 400, ultimate tensile up to 185,000 to 200,000 lb. per sq. in., and from this extreme go in the other direction and cast alloys with elongation of 70 per cent, and 15 Brinell. In other words, it is possible to cast almost any combination of copper, nickel, aluminum, manganese, silicon, tin, lead and zinc, restricted only to a pouring temperature not exceeding 2300 deg. F. and where the lead content does not exceed six per cent."

Lest Mr. Hagemeyer be accused of being influenced too much by paternal enthusiam, it should be added that his statements are borne out by practical experience in the four plants now using the process.

An enticing thought that inevitably arises when discussing plaster molds is: Can steel or gray iron be thus cast? The answer at the moment is no, but it has been tried and still is being studied. Hagemeyer terms such an idea a possibility rather than an immediate probability.

The types of castings which can be produced in plaster molds are shown in the photographs. Internal splines, ratchet teeth and stops can be cast and used without machining. Self rivets can be cast integrally and gears can be cast in most alloys so that they can be used as cast, except for machining the bore.

Inserts and threads as fine as 16 threads per in. are also being regularly cast. In one illustration can be seen an aluminum casting with a cast-in insert of threaded mild steel. Depressed as well as raised lettering can also be produced.

At the Briggs plant at present, two standard alloys are being cast, No. 10 contains 58 Cu, 1.25 Sn, 1 to 1.5 impurities, and the balance Zn. The other alloy, No. 20, is an aluminum bronze and runs 82.5 Cu, 4.5 Fe, 1.5 Mn and 11.5 Al.

It has been found that the bulk of the work being done is in these alloys. However, when an order is for a sufficient quantity to fill a pattern, or enough orders for a given alloy are on hand, the company also runs numerous variations of manganese bronze, silicon bronze, yellow brass alloys and aluminum bronze. Red brass and naval bronze can be cast, but the surfaces of these two alloys do not turn out as well as some of the other alloys.

The No. 10 alloy is rated with a

tensile strength of 55,000 to 60,000 lb. per sq. in., an elongation of 15 to 20 per cent, and a Brinell hardness of 110 to 120. The No. 20 alloy has a tensile of 75,000 to 85,000, an elongation of six to nine per cent, and a Brinell of 170 to 190.

*The more important patents covering various phases of the Capaco process are: No. 2,214,998 (mold extractor); 2,206,459 (mold extractor controls); 2,206,034 (mold forms); 2,197,213 (molding method); 2,201,037 (molding method); 2,206,650 and 2,201,038 (mold drying process); 2,197,212 (mold forms); 2,247,777 (forming castings); 2,186,019 (pouring stand); 2,198,498 (forming gate tubes); Re 21,461 (molding apparatus); 1,893,309; 2,201,037; Re 21,046. Numerous patents are pending or have been issued. Classical use of paster for producing statuary, etc., touched upon in "Alfred David Lenz System of Los Wax Casting," National Sculpture Society, New York, also Technical Studies in the field of Fine Arts, Harvard University, Vol. VIII, No. 4.

Conserving Aluminum in Die Casting

(CONTINUED FROM PAGE 63)

in respect to dimensional change. Known slight differences in analysis and possible differences in casting practice will probably explain this discrepancy when a complete story is available. Results obtained by New Jersey Zinc Co. indicate some difference between alloy XXV and the 1.5 per cent aluminum alloy, but the results are too incomplete to say whether the difference will be objectionable. They further report that to retain as favorable a comparison with the specification alloy as above, a low-aluminum substitute for alloy XXIII, which contains 4 per cent aluminum and 0.3 per cent magnesium, must have at least 2.0 per cent aluminum.

Limitations of Substitution

Attention is drawn to the following points on which information is lacking or incomplete: (1) The range of permissible die and metal temperatures has not been determined. Some alloys of this type have been previously encountered which had a too narrow permissible range for commercial operation. (2) Creep resistance, which is a property of governing importance in many uses of zinc die castings, particularly where elevated temperatures are encountered, has not been determined. The New Jersey Zinc Co. hopes to have rapid preliminary tests available on this within a few weeks.

Varying reports have been heard

concerning the experiences of die casters attempting to use these alloys. Some difficulties have been encountered due to the difference in solidification shrinkage characteristics and greater hot shortness of the lower aluminum alloys. In some instances, these difficulties have been overcome by increasing the aluminum content from 1.5 to 2 per cent. To what extent these difficulties can be overcome by attention to die design and casting practice is not yet known. In spite of the probability that a large number of castings can be successfully made with these alloys, the available evidence indicates that due to the above difficulties some castings cannot be produced successfully with alloys of reduced aluminum content.

Stainless Steel

(CONTINUED FROM PAGE 52)

not be overlooked and should be exploited where feasible.

The percentage of cold reduction required for any elongation can be read from Figs. 5 and 6. With the cold reduction established, the other mechanical properties can be determined from the curves. Table III summarizes the values of the mechanical properties determined from the curves at various ductility levels for the two alloys.

It can be seen from this table that at any ductility level the corresponding values of tensile strength, tensile yield strength, and compressive yield strength are greater for the 17-7 alloy than for the 18-8 alloy. The beneficial effects of the low temperature heat treatment, particularly on the tensile and compressive yield strengths, can again be observed. Strip having an elongation of 10 to 15 per cent in 2 in. possesses sufficient ductility to permit the necessary bending incident to the fabrication of most structural members. It will be noted that at an elongation of 15 per cent in 2 in. the heat treated 17 per cent chromium 7 per cent nickel alloy has the following longitudinal mechanical properties: Tensile strength, 193,000 lb. per sq. in.; tensile yield strength, 173,000 lb. per sq. in.; compressive yield strength, 155,000 lb. per sq. in.; elongation in 2 in., 15 per cent.

If the structure permits the use of the transverse compressive properties, a compressive yield strength after heat treatment of 170,000 lb. per sq. in. can be obtained at 15 per cent transverse elongation.

In comparing the 18 per cent chromium 8 per cent nickel curves with those for 17 per cent chromium 7 per cent nickel, it will be noted that the slope of the 17-7 curves is greater, which shows that this alloy work hardens at a greater rate than does the 18-8 material.

Spot values of the mechanical properties at 35 per cent cold reduction on two series of alloys are tabulated in Table I. The chromium levels in these two alloys were maintained at 17 and 18 per cent.

and the nickel content was varied from 5 to 9 per cent. The manganese was held at from 0.5 to 1.32 per cent, and the carbon from 0.10 to 0.14 per cent. It will be seen that as the nickel is decreased in both series of alloys the rate of work hardening increases. The value of the low temperature heat treatment is apparent.

In designing structural members at stresses which exceed the proportional limit of the material, the tangent modulus values assume importance. In Table II the values of the tangent modulus for 18-8 and 17-7 at various stress levels are tabulated. In Figs. 9, 10, 11 and 12 the tensile and compressive tangent modulus values are plotted against per cent cold reduction at various stresses. A comparison of the longitudinal as-rolled tangent modulus values in tension and compression at ductility levels from 10 to 30 per cent is made in Table IV. These values were determined from Figs. 9, 10, 11 and 12.

It will be noted that the tangent modulus values of the 17-7 alloy are greater at equivalent stresses than those for the 18-8 material. Of course, for those stresses below the proportional limit, the tangent modulus becomes the initial modulus.

At the present time the chrome-manganese-nickel austenitic alloys are of particular interest. Included in Table I are values of the mechanical properties of an 18 per cent chromium 8 per cent manganese 2 per cent nickel alloy, and an 18 per cent chromium 5 per cent manganese 5 per cent nickel alloy after various degrees of cold working. It will be noted that fine mechanical properties can be obtained in these alloys. Commercial heats of the 18-5-5 analysis have been successfully rolled.

Corrosion tests in boiling 65 per cent nitric acid were conducted on the material as-cold-rolled and after cold rolling and heat treatment. It was found that the low temperature stress relieving heat treatment did not affect the corrosion resistance of the cold rolled material.

Summary

The tests conducted at the Electro Metallurgical Research Laboratories show that excellent mechanical properties can be obtained in the austenitic chromium-nickel stainless steels by cold work and proper heat treatment. They further show that the chemistry of these steels is important in that it affects the tendency of the austenitic structure to transform into ferrite which affects the rate of work hardening and hence the mechanical properties.

Tests are now in progress on an 18 per cent chromium 8 per cent manganese 2 per cent nickel alloy, and on an 18 per cent chromium 5 per cent manganese 5 per cent nickel alloy. To date the results look promising.

Simplified Molybdenum Determination

(CONTINUED FROM PAGE 62)

Step No. 4
Cool slightly, add 50 c.c. water and cool to 65 deg. F.
Step No. 5
Pour into 150 to 250 c.c. separatory funnel.
Step No. 6
Rinse beaker with 10 c.c. of sodium thiocyanate adding same to funnel and mix thoroughly.
Step No. 7
Add 25 c.c. stannous chloride and mix thoroughly.
Step No. 8
Add immediately exactly 50 c.c. of technical butyl acetate to funnel.
Step No. 9
Shake vigorously for 1 min.
Step No. 10
Allow acid layer to separate and drain off along with a few c.c. of butyl acetate.
Step No. 11
Rinse Photelometer cell with colored butyl acetate from funnel.
Step No. 12
Fill cell, clean surface of cell and take reading.
Step No. 13
Read per cent of molybdenum present from curve previously prepared with standard steels.

Solutions Required

NaCNS—50 gm. per liter of water.
$SnCl_2$—112 gm. $SnCl_2$ dissolved in 100 c.c. concentrated HCl. Heat until in solution and dilute to 1 liter with cold water.
NOTE: Cleanliness of the Photelometer cells used both for containing the butyl acetate and the distilled water is extremely important.

Modifications of Procedure

For steels with 0.50 to 1.40 per cent molybdenum content, use 0.05 gm. sample with only 15 c.c. addition of stannous chloride in Step No. 7.

For steels containing large percentages of tungsten and alloys such as 18-4-1 high speed and 0.01 to 0.60 per cent Mo, add 5 to 10 c.c. of phosphoric acid (ortho) to Step No. 2, and 35 c.c. of stannous chloride instead of 25 c.c. in Step No. 7.

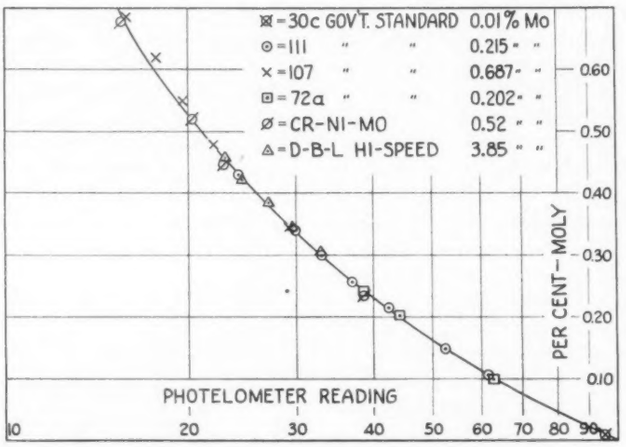
For steels containing 1.40 to 7.00 per cent molybdenum with tungsten present, such as DBL high speed steel, use 0.1 gm. sample and add 5 to 10 c.c. phosphoric acid in Step No. 2.

Step No. 5 should be revised to read: Pour into 100 c.c. volumetric flask and fill to mark with washings from beaker. Pour back into dry beaker and take 10 c.c. measured portion with pipette into funnel.

Step No. 6 should read: Add 50 c.c. of 30 per cent perchloric (15 c.c. of 70 per cent acid plus 35 c.c. of water) and 10 c.c. of sodium thiocyanate and mix thoroughly.

Step No. 7 should read: Add 10 c.c. of stannous chloride and mix thoroughly.

Above 7.00 per cent molybdenum, aliquot accordingly.



Standard curve and a key to the standard samples used for forming this curve.

Observations

The additions of stannous chloride must be made judiciously as apparently it reacts to reduce the molybdenum causing fading if too much excess is present. Consequently when aliquot portions are taken the iron content is lessened and this condition must be compensated for correspondingly, by lowering the amount of stannous chloride added.

Ed. Note:—Mr. Chase of the Carnegie Illinois Steel Corp. has also devised a a modification similar to that described herein by Mr. Poole, but he has changed the concentration of potassium thiocyanate instead of the stannous chloride.

If for any reason more than 0.1 gm. sample is used, there must be an *increase* in the amount of stannous chloride added.

In the case of high speed steels, the higher alloy content apparently slows up the reaction somewhat, necessitating additional stannous chloride in Step No. 7, as noted in revised Step No. 7.

The phosphoric acid addition is necessary for steels containing tungsten. If perchloric acid is used alone, tungstic oxide separates and since it occludes molybdenum an erroneous result is obtained.

The above method obviates the necessity of saturating the butyl acetate twice immediately prior to making the extraction. This saves approximately 5 to 10 min. operating time.

The methods outlined for determining molybdenum content have been applied successfully to the following types of steels made in the electric melting furnaces of the Ingersoll Steel & Disc Division:

(1) High speed steels, 18-4-1, chrome-vanadium-tungsten alloy.
(2) DBL high speed steels, chrome-vanadium-tungsten,molybdenum alloy.
(3) Chrome-molybdenum steels.
(4) Molybdenum-tungsten-chrome-vanadium steels, low alloy content.
(5) Nickel molybdenum.
(6) Nickel-chrome-molybdenum.
(7) Straight molybdenum.
(8) Stainless steels containing molybdenum.

Calibrating Standard Curve

The curve which coordinates the reading obtained with the Photelometer with the per cent of molybdenum present in the steel must of necessity be plotted from steels with known molybdenum content. The points on the curve for the Photelometer used in the Ingersoll laboratory were determined by four chemists at different periods of time. Each point located was the average of at least five separate determinations by the various men.

A surprising feature of this calibration work was the degree of accuracy with which the men checked each other. The accuracy was of the order of plus or minus 1 to 2 per cent of the molybdenum content.

It is apparent from the location of the points of the various types

	Molybdenum Content, Per Cent	Other Alloys Present
Government Steel Standard 30c	0.01	Cr and V
Government Steel Standard 111	0.215	Ni
Government Steel Standard 107	0.687	Cr-Ni cast iron
Government Steel Standrad 72a	0.202	Cr
Chrome-nickel-molybdenum steel	0.52	Cr and Ni
DBL	3.85	Cr, V and W

of steel that the method is such that only one curve need be plotted for use in analytical work on steels with a wide range of alloy composition.

The standard steels used to calibrate the curve are shown above.

The readings in the accompanying table represent those obtained by the different chemists. One reading only is recorded for each determination. The accompanying chart shows the standard curve of molybdenum-photelometer readings.

Standard Sample	Weight of Sample Used	Per Cent Molybdenum Equivalent	Determinations and Corresponding Photelometer Readings 1	2	3	4	5	Average Photelometer Reading
U.S.B.S. 30 c	0.1	0.01	95	95.5	95.1	95	95	95.1
U.S.B.S. 111	0.1	0.215	42	42.2	42.5	42.5	42.2	42.3
U.S.B.S. 111	0.05	0.107	62.5	61.5	61.5	61.8	61	61.7
U.S.B.S. 111	0.07	0.15	52.5	51.5	53	52	53.5	52.5
U.S.B.S. 111	0.12	0.258	38	35.5	37.5	36	37.5	36.9
U.S.B.S. 111	0.14	0.30	33.5	32.2	33.2	32.5	33	32.9
U.S.B.S. 111	0.16	0.34	29.5	30	30	29	30.5	29.8
U.S.B.S. 111	0.2	0.43	24.2	24.5	25	23.2	23.3	24.1
U.S.B.S. 107	0.05	0.343	30	29.9	28	29	29.2	29.2
U.S.B.S. 107	0.07	0.48	23.2	21.5	21.5	23	21	22.0
U.S.B.S. 107	0.08	0.55	20.6	19.2	20.0	18.5	20.0	19.6
U.S.B.S. 107	0.09	0.62	18.1	18	17	18	18.2	17.8
U.S.B.S. 107	0.1	0.687	16.5	16	16	15	15.5	15.8
U.S.B.S. 72 a	0.05	0.10	63	63	62	63	63	62.8
U.S.B.S. 72 a	0.1	0.202	43.5	44.5	44	44	44	44.0
U.S.B.S. 72 a	0.12	0.24	38.2	38.5	38.5	39	38	38.4
Cr-Ni-Mo	0.1	0.52	20.1	20.8	20.2	20.2	20	20.2
Cr-Ni-Mo	0.13	0.676	15.6	15.9	15.5	15.5	15.2	15.5
Cr-Ni-Mo	0.085	0.445	22.8	21.8	22	23	24	22.7
Cr-Ni-Mo	0.045	0.236	39.2	38.8	37.5	37.2	40	38.5
DBL	0.1/10	0.385	27	27	27	27.5	27	27.1
DBL	0.08/10	0.308	32.8	32.8	32.8	32.9	32.6	32.8
DBL	0.09/10	0.346	29	29	30	30	29.8	29.6
DBL	0.11/10	0.423	24.8	24.9	24	24	24	24.3
DBL	0.12/10	0.462	22.9	23.2	23	22.8	23	23

Supervision Changed On Export Licenses for Non-War Goods

Washington

• • • **Effective Oct. 1,** all applications for licenses to export commodities and materials (other than arms, ammunition, and implements of war and tin-plate scrap) will be submitted to the chief of the Office of Export Control, Economic Defense Board, Washington, according to Comprehensive Export Control Schedule No. 3, just published by Milo Perkins, executive director of the board. Upon approval, the licenses will be issued by this office. Heretofore, applications for licenses have been submitted to the division of controls of the Department of State. This new procedure follows the transfer of all export control functions, except those of the Army and Navy Munitions Board, to the Economic Defense Board, pursuant to the Executive order of Sept. 15.

The clearance section already established in the office of export control will continue to receive and clear export proposals involving shipments to the unoccupied friendly countries of the world.

All technical data previously subject to license by the administrator of export control remain subject to license requirements. Licenses for exportation of technical data on patents, designs, or models made in the United States have been issued by the Commissioner of Patents, Department of Commerce, since Sept. 20, 1941.

General licenses for commodities covered by export control commodity schedules are now classified by the letter "G" followed by the number indicating the country of destination. Department of Commerce numbers shown in Export Control Schedule No. 3 must be placed on shipper's export declarations and also on applications for export licenses. Rigid enforcement of this regulation will not be invoked until Nov. 1.

Two More TNT Plants Inaugurate Production

Chicago

• • • **Two more TNT** plants have been added to the nation's chain of active producers. Kankakee (Ill.) ordnance works went into production the last week in September, less than a year after ground was broken. Three days later the Weldon Springs (Mo.) ordnance works started. At Kankakee, the first few hundred of the eventual payroll of 3000 are on active duty. At Weldon Springs, the first of 14 lines went into action 10 months after start of construction.

Independent Union Hits at SWOC Drive for Closed Shop

Gary, Ind.

• • • **Charges that** the SWOC is violating its contract with Carnegie-Illinois Steel Corp. by undercover efforts to gain a closed shop have been made by the Independent Steel Workers Bargaining and Benefit Association. A. L. LaCroix, chairman of the independents, said his organization had tested the workers' sentiment on a closed shop and found that both CIO union members as well as the independents were opposed to the move.

S-T Studies Shipping Hot Iron As Jeanette Stack Goes Out

Youngstown

• • • **Youngstown Sheet & Tube** Co. has blown out its Jeanette blast furnace at Brier Hill for relining, a job that will take two months. According to company officials, this may necessitate shipping molten iron in ladle cars from the Campbell blast furnaces to the Brier Hill open hearths. However, the district's iron-making rate remained relatively unchanged since Carnegie-Illinois Steel blew in its sixth furnace last week after certain repairs had been made.

PERSONALS

WILLIAM F. LAMOREAUX, director of research, Meehanite Metal Corp., Pittsburgh.

o o o

• **William F. Lamoreaux** has been appointed director of research of the Meehanite Metal Corp., Pittsburgh. Mr. Lamoreaux has had extensive experience in research in both the metallurgical and chemical fields and was for many years vice-president, general manager and director of the Ducktown Chemical & Iron Co., Isabella, Tenn.

• **Herman G. Klemm,** executive engineer of the Glenn L. Martin Co., Baltimore, has been named chief engineer of the new wholly-owned subsidiary, the Glenn L. Martin-Nebraska Co., Omaha, Neb. Mr. Klemm joined the Martin company at its Cleveland plant in 1927 as a junior engineer. He was in charge of hull design when the company moved to Baltimore in 1929, then became chief draftsman and later executive engineer.

Harry M. Shealey, assistant factory superintendent in charge of the Canton division of the Martin company, is factory superintendent of the new company and **Carl B. Hamlin,** chief inspector at Middle River, becomes chief inspector at Omaha.

• **G. K. Viall,** vice-president of Chain Belt Co. of Milwaukee, has been appointed as head of a new division of research and development now being organized by the company. Mr. Viall has been connected with Chain Belt Co. since 1921 in various capacities, including chief engineer, chain division, assistant to the president and works manager. In assuming his new position, he will also retain his position as vice-president in charge of the construction machinery division.

B. F. Devine, who joined the Chain Belt organization in 1909, has been promoted from sales manager of the construction machinery division to the position of manager of the construction machinery division. Mr. Devine has served in the purchasing department, the engineering sales department and later as assistant sales manager of the construction machinery division. In his new position he also will supervise the management of sales of this division.

• **Marcel Dupont,** engineering consultant, has become associated with Sadonia, Ltd., New York, as general manager, succeeding Leon G. Rucquoi, who has resigned.

• **Paul S. Ellison** has been appointed director of advertising and sales promotion for the Hygrade Sylvania Corp. Mr. Ellison joined the company 10 years ago and has held the post of advertising manager and renewal sales manager of the radio tube division until his present appointment.

OBITUARY...

• **Henry Buker,** vice-president of the Brown & Sharpe Mfg. Co., Providence, and continuously identified with that concern for the past 49 years, died Sept. 29 at the Jane Brown Hospital after a brief illness. He was 68 years old. After graduating from the Phillips-Exeter Academy, Mr. Buker served a complete apprenticeship at Brown & Sharpe, receiving a practical training in machine tool building and at the same time attended evening courses at the Rhode Island School of Design, graduating in 1895. He spent two years abroad to acquire a speaking knowledge of French and German, and represented the company at the Paris World's Fair in 1900. Upon his return, he was placed in charge of Brown & Sharpe's small tool department. In 1908 he took charge of sales of the gear department and foundry and two years later was transferred to Chicago where he was in charge of the company's sales office for four years. He then returned to the sales department in Providence. Mr. Buker was made general sales manager and assistant secretary in 1917 and in 1924 he was made vice-president. He became one of the members of the first board of directors established by the company in 1937. He also was president and director of Brown & Sharpe of New York, Inc., and of the Brown & Sharpe Co., selling organization of the parent firm.

In 1933, Mr. Buker was elected chairman of the NRA Code Authority for the machine tool and forging machinery industries and had been a member of the industry's permanent committee dealing with national defense problems since its formation in June, 1940.

THE LATE Henry Buker, vice-president of the Brown & Sharpe Mfg. Co., Providence.

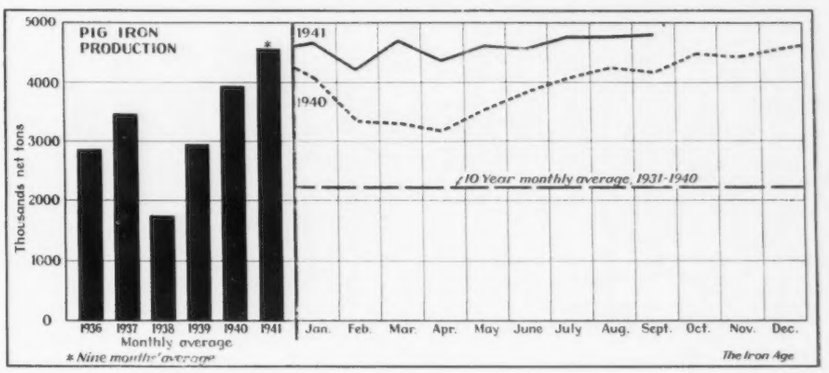
September Pig Iron Production at 98.8 Per Cent

• • • **Production of** coke pig iron in September totaled 4,716,901 net tons compared with 4,791,432 tons in August. Output on a daily basis last month showed a gain of one per cent over that in August, or from 154,562 tons to 157,230 tons a day in September. The operating rate for the industry was 98.8 per cent of capacity in September, compared with 97.5 per cent in August.

On Oct. 1 there were 216 furnaces in blast producing at the rate of 157,230 a day, compared with 213 in blast on Sept. 1 with a production rate of 155,020 tons. The United Steel Corp. blew in two furnaces during September, independent producers put one in blast and took one off and merchant producers blew in two furnaces and took off one.

Among the furnaces blown in were: One Ohio, Carnegie-Illinois Steel Corp., one Holt, Tennessee Coal, Iron & Railroad Co., one Sparrows Point, Bethlehem Steel Corp., one Colonial, U. S. Pipe & Foundry Co. and one furnace of the Koppers United Co.

Furnaces blown out included: one Brier Hill, Youngstown Sheet & Tube Co., and one Toledo, Interlake Iron Co.



Production by Districts and Coke Furnaces in Blast (In Net Tons)

	September, 1941		August, 1941			Oct. 1, 1941		Sept. 1, 1941	
		Daily % of Capacity		Daily % of Capacity	September, 1940	No. in Blast	Operating Rate	No. in Blast	Operating Rate
Eastern	34,327	101.6	34,411	97.6	33,194	2	1,145	2	1,100
Buffalo	290,789	96.7	302,796	97.4	267,033	14	9,695	14	9,770
Philadelphia	418,750	98.9	402,871	92.0	384,971	18	14,210	17	12,160
Ferro. and Spiegel	16,908	99.6	17,091	97.0	7,603	4	565	4	550
Pittsburgh	1,114,689	94.4	1,144,425	95.7	991,789	48	37,155	47	37,375
Ferro. and Spiegel	39,571	94.4	44,490	102.6	30,052	5	1,320	5	1,435
South Ohio River	97,532	92.7	96,224	88.5	78,174	7	3,250	7	3,105
Valleys	565,399	99.8	587,416	100.4	522,981	24	18,890	24	18,770
Wheeling	205,823	103.6	213,394	104.0	166,921	9	6,860	9	6,885
Cleveland	400,827	101.6	418,654	102.7	361,349	16	12,730	17	13,505
Chicago	1,045,562	101.7	1,042,110	99.4†	883,390	40	34,850	39	33,615
Ferro. and Spiegel	.....	...	13,705	...	.....	0	.....	1	440
St. Louis	.....	...	.....	...	.....	...	.....	0	.....
Detroit	102,535	91.3	102,187	88.0	93,768	4	3,420	4	3,295
Western	65,869	108.3	71,565	113.9	56,503	4	2,195	4	2,310
Southern	308,737	101.8	297,871	95.1	298,026	19	10,290	18	10,335
Ferromanganese	1,479	16.4	2,222	24.2	.....	1	50	1	70
Total	.....	...	4,791,432	97.5	4,287,779	...	.....	213	155,020

†Spiegeleisen rate included.

Production of Coke Pig Iron and Ferromanganese

	Pig Iron*		Ferro-Mn†	
	1941	1940	1941	1940
January	4,663,695	4,032,022	35,337	43,240
February	4,197,872	3,311,480	33,627	38,720
March	4,704,135	3,270,499	37,808‡	46,260
April	4,334,267	3,137,019	44,341	43,384
May	4,599,966	3,513,683	47,256	44,973
June	4,553,165	3,818,897	42,582	44,631
½ year	27,053,100	21,083,600	240,951	261,208
July	4,770,778	4,053,945	47,193	43,341
August	4,791,432	4,238,041	52,735	37,003
September	4,716,901	4,176,527	46,932	33,024
October	.....	4,445,961	.....	32,270
November	.....	4,403,230	.....	31,155
December	.....	4,547,602	.....	35,666
Year	.....	46,948,906	.....	473,667

*These totals do not include charcoal pig iron. †Included in pig iron figures. ‡Revised from March to July to omit spiegeleisen production.

Daily Average Production of Coke Pig Iron

	1941	Per Cent Capacity	1940	Per Cent Capacity
January	150,441	95.5	130,061	85.8
February	149,924	95.2	114,189	75.1
March	151,745	96.9	105,500	68.9
April	144,475	91.8	104,567	68.6
May	148,386	93.8	113,345	74.8
June	151,772	95.9	127,297	83.9
½ year	149,465	94.5	115,844	76.1
July	153,896	97.1*	130,772	86.3
August	154,562	97.5	136,711	90.4
September	157,230	99.2	139,218	92.2
October	.....	...	143,418	94.8
November	.....	...	146,774	97.1
December	.....	...	146,697	97.2
Year	.....	...	128,276	84.6

*Revised for capacity as of June 30, 1941.

Merchant Iron Made, Daily Rate

	1941	1940	1939
January	20,812	16,475	11,875
February	21,254	14,773	10,793
March	23,069	11,760	10,025
April	20,434	13,656	9,529
May	21,235	16,521	7,883
June	21,933	13,662	8,527
July	21,957	16,619	9,404
August	22,578	17,395	11,225
September	21,803	17,571	12,648
October	.....	18,694	16,409
November	.....	22,792	16,642
December	.....	19,779	16,912

CONSTRUCTION STEEL

. . . STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Awards of 8400 tons are the lowest for any week this year; new projects drop to 9200 tons from 21,725 tons last week.

AWARDS

NORTH ATLANTIC STATES

2000 Tons, South Boston, Navy dock buildings Nos. 30 and 31, to American Bridge Co., Pittsburgh, through Morton C. Tuttle Co., Boston, contractor.

410 Tons, Aliquippa, Pa., manufacturing building for National Can Co., to American Bridge Co., Pittsburgh.

390 Tons, Fort Tilden, Long Island, N. Y., trusses and beams for War Department, to American Bridge Co., Pittsburgh.

390 Tons, Portsmouth, N. H., Navy Yard storehouses D, E, and F, to Lehigh Structural Steel Co., Allentown, Pa.

299 Tons, Port Allegheny, Pa., addition for Pittsburgh-Corning Plate Glass Co., to Pittsburgh Bridge & Iron Co., Pittsburgh.

282 Tons, Middle River, Md., Eastern Avenue underpass, to American Bridge Co., Pittsburgh.

260 Tons, Trenton, N. J., DeLaval Separator Co. building, to American Bridge Co., Pittsburgh.

260 Tons, New York, Lincoln Hospital dormitory, to Schacht Steel Construction Co., New York.

223 Tons, Clearfield, Pa., addition to mill building for Harbison-Walker Refractories Co., to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, Montour Falls, N. Y., crane girders for Shepard-Niles Co., to American Bridge Co., Pittsburgh.

105 Tons, Carbon County, Pa., bridge, to Pine Brook Iron Works, Scranton, Pa.; Joseph Banks Construction Co., contractor.

THE SOUTH

255 Tons, Etowah, Tenn., construction trestle towers and girder supports for TVA, to American Bridge Co., Pittsburgh.

218 Tons, Hampton, Va., impact basin, to Lehigh Structural Steel Co., Allentown, Pa.

170 Tons, Rock Hill, S. C., Winthrop College dormitory building, to Ingalls Iron Works Co., Birmingham.

100 Tons, Anniston, Ala., regimental garage for Army constructing quartermaster, to Ingalls Iron Works Co., Birmingham.

CENTRAL STATES

500 Tons, various locations, additions for Rock Island Lime Co., to Vierling Steel Works, Chicago.

340 Tons, Dayton, Ohio, propeller laboratory at Wright Field, to Indiana Bridge Co., Muncie, Ind.

299 Tons, Illinois and Iowa, bridges for Chicago Great Western Railway, to American Bridge Co., Pittsburgh.

250 Tons, St. Louis, ordnance works boiler house for government, to American Bridge Co., Pittsburgh.

230 Tons, Wyandotte, Mich., E. I. du Pont de Nemours & Co., Inc., new plant, to Ernst Iron Works, Buffalo.

WESTERN STATES

1000 Tons, Los Angeles, Figueroa Street bridge over Los Angeles River and railroad tracks, to Bethlehem Steel Co., Los Angeles.

180 Tons, Seattle, quartermaster pier B (Specification QM7212-42-1), to Bethlehem Steel Co., Seattle.

PENDING STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

425 Tons, Lackawanna, N. Y., senior high school.

410 Tons, New York State, railroad bridge PSC-6630.

270 Tons, Southfield, N. Y., State railroad bridge RC-41-43.

200 **Tons.** Buffalo, building addition for Hanna Furnace Co.; bids in.
170 **Tons,** Kearny, N. J., garage for Western Electric Co.

THE SOUTH

2000 **Tons,** Fayette County, Ky., highway bridge; bids Oct. 10.

CENTRAL STATES

1550 **Tons,** Centerline, Mich., tank arsenal extension for Chrysler Corp.
720 **Tons,** Cuyahoga County, Ohio, State grade separation.
375 **Tons,** Ullin, Ill., girder spans for Illinois Central System.
195 **Tons,** Shelby County, Ohio, Miami River State bridge.
172 **Tons,** Sidney, Ohio, State highway improvement over 20 ft. span; bids close Oct. 14.

WESTERN STATES

1500 **Tons,** Seattle, Spokane Street viaduct; bids soon to city.
875 **Tons,** Sunnyvale, Cal., punched plates and shapes for Wooldridge Co.
345 **Tons,** Bremerton, Wash., extension to Navy transportation building.

FABRICATED PLATES

PENDING PROJECTS

2000 **Tons,** Seattle, 74 tanks for United States Engineer; bids soon.
200 **Tons,** Pittsburg, Cal., water clarifying tanks.

Weekly Bookings of Construction Steel

Week Ended →	Oct. 7, 1941	Sept. 30, 1941	Sept. 9, 1941	Oct. 8, 1940	Year to Date 1941	Year to Date 1940
Fabricated structural steel awards	8,400	17,700	19,800	39,400	1,059,795	841,765
Fabricated plate awards	0	590	265	2,210	105,425	120,675
Sheet steel piling awards	0	0	0	400	25,260	60,835
Reinforcing bar awards	11,855	38,125	53,345	12,600	595,530	364,395
Total letting of Construction Steel	20,255	56,415	73,460	54,610	1,786,010	1,387,670

Collapse of Soo Bridge Slows Movement of Ore

• • • **Collapse of** a bridge across the St. Mary's river at Sault Ste. Marie, Mich., on Monday delayed numerous vessels in the Soo Canal, constituting a threat to the movement of Lake Superior iron ore. One span in the bridge crashed, carrying a locomotive and two freight cars into the river.

In iron ore circles, the disruption was viewed as a serious setback, but not a major catastrophe by any means. It was believed the debris could not be removed for at least two days and might require eight days. Some of the smaller vessels were scheduled to be rerouted through the Canadian side of the Soo where the channel is not so deep as on the American side.

SCRAP

. . . MARKET ACTIVITIES AND PRICE TRENDS

No Scrap Price Increase, OPA Says

• • • While open hearths were shutting down in various sections of the nation early this week through lack of scrap, Leon Henderson, OPA price administrator, issued an emphatic statement that no upward adjustment in ceiling prices for iron and steel scrap can be expected.

After flaying unnamed members of the scrap trade for inspiring rumors of official higher prices, Henderson stated that "the maximum prices established in the iron and steel scrap schedule are ample to bring out all scrap available. No increases in the general price level are warranted and none will be made. Neither will the grade definitions be changed."

At least one open hearth went down in the Eastern Pennsylvania district; three were taken off at Ashland, Ky., and in other sections it was said shutdowns are imminent. These are not the first furnaces to be shut down due to the claimed lack of scrap, others having been reported here on a number of other occasions. Hourly output of raw steel has suffered through the poor grades being charged, some steel men say. Foundry operations also are facing the possibility of a serious slackening through difficulty in obtaining quantities of desirable scrap.

Shipments of scrap began dribbling into St. Louis last week from the Southwest, the result of the recent revision of remote scrap prices. However, the amount so far received is far below expectations.

Members of the scrap trade were urged to redouble their collection efforts in a letter sent out by E. C. Barringer, secretary of the Institute of Scrap Iron & Steel. He urged all dealers to get behind the OPM program for moving remote scrap; to put more emphasis on auto scrapping and rural collections.

Barringer also revealed that the governor of Michigan had called on all industrial plants throughout his state to make careful checks of all obsolescent machinery and material and to send such materials to the steel mills of the country via the regular channels of trade.

The members of the institute were advised that progress was being made in all directions, but that intensified efforts must continue as the mills and foundries were using 1,000,000 gross tons of scrap more each month this year than they did last year. A close observance of price schedules promulgated by OPA was also emphasized.

Pittsburgh—Many steel companies continue on the ragged edge as far as scrap supplies are concerned and should anything interfere with incoming shipments, many units would be immediately forced down owing to the low or non-existent point of inventories. The trade continues to await the imposition of a priorities system but meanwhile is finding it extremely difficult to pick up additional supplies.

•

Cincinnati—Lacking scrap, the Ashland unit of Armco has reduced its active open hearths to five out of a total of eight during the present week. Operations at Middletown are 100 per cent, with company officials feeling that they have sufficient scrap to maintain this rate of operation for the next three weeks. Elsewhere in the district, steel producers are still maintaining the total number of open hearths in operation but report that the actual hourly output is off as much as 15 per cent of normal, because of the poor grade of scrap they are being forced to use.

•

Boston—The leading producer at Worcester is understood to be urging the OPA to raise the ceiling price of No. 2 steel. The cost of labor involved in preparing it is so great that yards cannot afford to produce No. 2 steel, which accounts in a large measure for the acute shortage. Prices paid for material by two brokers for barge shipment to Sparrows Point, in substance above the ceiling price, have practically checked shipments of No. 2 steel elsewhere. Motor blocks are the most active item. For clean blocks $23 to $23.50 a ton delivered is being paid, and for uncleaned, shrinking up to 40 per cent, $1 a ton less.

•

St. Louis—Scrap iron from the southwest has begun to move into St. Louis for the first time since the present emergency, one broker getting 3000 tons, but receipts from other sections show no improvement. One mill has sufficient scrap on hand to operate for two weeks, but the situation is better with other district mills.

•

Detroit—The critical condition caused by the decline of incoming scrap to mills in the Detroit area continues, although no furnaces have been closed down yet. Production is on a nip and tuck basis with each day's incoming scrap going directly into production. An electric furnace operator is being hard hit also by the shortage situation. Direct deals in which mills in other areas take back from consumers all available scrap is being blamed for the seriousness of the situation.

•

Philadelphia—Officials of the Worth Steel Co. stated this week that one open hearth furnace had been shut down because of the acute need for scrap, and that plans were being made to take another furnace out of production within the next week or so unless greater quantities of scrap are forthcoming.

•

Cleveland—The flow of scrap continues slack, and one mill reports that its inventory is down 20,000 tons since the 1st of September. One company is understood to have taken off several open hearths chiefly due to a shortage of scrap. Curtailment of the Youngstown operating rate is expected within 30 days, unless the scrap situation improves. Most dealers and mill buyers agree that Federal allocation of scrap will adjust the situation favorably, since excessive inventories are reported in some hands. The scramble for scrap has risen to such a pitch that one mill is reported to be getting plant scrap direct from its steel customers and bundling it on its own premises, without the agency of a scrap dealer.

•

Buffalo—Announcement that a $1,000,000 smelting plant will be build here to convert entire old automobiles into iron by a "new, secret process," has failed to excite scrap dealers. One local steel plant is reported importing scrap from Cuba this week in an effort to keep open hearth operations from falling off.

. . . Comparison of Prices

(Advances Over Past Week in **Heavy Type;** Declines in ***Italics***)

(Prices Are F.O.B. Major Basing Points)

	Oct. 7, 1941	Sept. 30, 1941	Sept. 9, 1941	Oct. 8, 1940
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wire and Wire Products:				
(Cents Per Lb.)				
Plain Wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

	Oct. 7, 1941	Sept. 30, 1941	Sept. 9, 1941	Oct. 8, 1940
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$24.84
No. 2, Valley furnace	24.00	24.00	24.00	23.00
No. 2, Southern Cin'ti	24.06	24.06	24.06	23.06
No. 2, Birmingham	20.38	20.38	20.38	19.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	23.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	24.34
Basic, Valley furnace	23.50	23.50	23.50	22.50
Malleable, Chicago†	24.00	24.00	24.00	23.00
Malleable, Valley	24.00	24.00	24.00	23.00
L. S. charcoal, Chicago	31.34	31.34	31.34	30.34
Ferromanganese‡	120.00	120.00	120.00	120.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$21.50
Heavy melt'g steel, Phila.	18.75	18.75	18.75	20.625
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	19.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	18.50
Low phos. plate, Youngs'n	23.00	23.00	23.00	24.00
No. 1 cast, Pittsburgh	22.00	22.00	22.00	20.25
No. 1 cast, Philadelphia	24.00	24.00	24.00	22.25
No. 1 cast, Ch'go*	21.00	21.00	21.00	17.75

*Changed to gross ton basis, April 3, 1941.

Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$6.125	$6.125	$6.125	$4.75
Foundry coke, prompt	6.875	6.875	6.875	5.25
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	51.00
Zinc, East St. Louis	7.25	7.25	7.25	7.25
Lead, St. Louis	5.70	5.70	5.70	4.85
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

The various basing points for finished and semi-finished steel are regularly listed in detailed price tables, and will appear next week.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

. . . Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Oct. 7, 1941	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.30467c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.30467c. a Lb.	$22.61 a Gross Ton	$20.62 a Gross Ton

	High	Low	High	Low	High	Low
1941	2.30467c.,	2.30467c.,				
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1939	2.35367c., Jan. 3	2.26689c., May 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1937	2.58414c., Mar 9	2.32263c., Jan. 4	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1933	1.95578c., Oct. 3	1.75836c., May 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1932	1.89196c., July 5	1.83901c., Mar. 1	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1931	1.99629c., Jan. 13	1.86586c., Dec. 29	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1929	2.31773c., May 28	2.26498c., Oct. 29	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
			18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

A weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip. These products represent 78 per cent of the United States output. This revised index recapitulated to 1929 in the Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

NON-FERROUS METALS

. . . MARKET ACTIVITIES AND PRICE TRENDS

Lead Under Priority Control; Brass Price Schedule is Amended

All lead supplies, including domestic and imported metal, were placed under full priority control this week by the OPM Division of Priorities. The new control over this metal, one of the last to be touched by official priority regulation, is provided in General Preference Order M-38, which sets up the allocation system. A vital defense metal, civilian and defense lead requirements have created a shortage of metal. Current consumption is at the rate of 960,000 tons a year, while production, including that from foreign ores, is not over 600,000 tons. The difference is now being made up from scrap and foreign imports of refined metal.

Lead refiners and dealers must file with the OPM, not later than the 20th of each month, a schedule of proposed shipments for the following month. The order also provides for a lead pool, from which lead will be allocated by OPM; and in shipping the balance of production not covered by the pool, each refiner must give preference to defense orders, as required by Priorities Regulation No. 1. All Metals Reserve Co. lead will be allocated by OPM. MRC lead has constituted from 30 to 40 per cent of the available metal for quite some time, and has provided OPM with, in effect, a priority control over a good portion of the available metal.

With lead production of the American Metal Co., Inc., in Mexico, halted by strikes, the MRC receipts are being considerably affected and it is reported that negotiations are under way for the purchase of a substantial accumulation of Canadian lead.

Amendments were made this week to the brass mill scrap price schedule, adding to the schedule copper and nickel scrap and revising the definition of "brass mill scrap" to conform to the OPM priority order covering copper and copper alloy scrap. Also, the enforcement section of the order has been modified to take into account possible cooperation by state, county and local governments.

Metals Reserve Co. signed a contract with the Peruvian government this week for the purchase of all minerals not sold by Peru in the course of normal business. The contract covers copper ores, concentrates, and matte; antimony ores; lead ores, concentrates, and refined bars; tungsten ores and concentrates; vanadium concentrates; zinc concentrates and electrolytic zinc.

Copper allocation certificates for October were received from OPM Saturday, and consumers are reported to have expressed disappointment over their allotments, reported in some instances to be 40 to 45 per cent less than would be needed. Some bonded copper business is reported on the basis of 11.50c. a lb., f.a.s., New York.

Word is now awaited concerning the outcome of the negotiations between the Phelps Dodge Corp., and the Defense Plant Corp., for the erection of additional copper producing facilities at Morenci, Ariz. The proposed plant will have an estimated capacity of 60,000 tons of refined copper a year, and will cost some $28,000,000 to erect.

Tin offerings on the New York market are rather scarce due to high Far Eastern prices, which have hovered at 52c. a lb., and higher for the past several weeks. Large importers report they have nothing to offer either for delivery during October and November or from vessels afloat. Tin shortages are expected shortly when large buyers who quit the market last July at the request of OPM, come back in the market for substantial tonnages.

Non-Ferrous Prices

(Cents per lb. for early delivery)

Copper, Electrolytic[1]	12.00
Copper, Lake	12.00
Tin, Straits, New York	52.00
Zinc, East St. Louis[2]	7.25
Lead, St. Louis[3]	5.70

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2]Add 0.39c. for New York delivery. [3]Add 0.15c. for New York delivery.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 16c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $193. per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

Steel Warehouses Receive OPM Quotas

Pittsburgh

• • • **Steel warehouses,** it is understood, have had their quota set by OPM and these units will be allowed shipments from producers during the final quarter of this year equal to actual shipments out of warehouses during the first quarter of 1941.

Last week quotas were set up for reinforcing bars and pipe which amounted to 80 per cent of the material received by the jobbers during the corresponding period in 1940, whereas the merchant wire products quota for the last quarter of this year was to be equivalent to 70 per cent of the material shipped to them during the last quarter of 1940.

The mere setting up of the quotas does not mean that warehouses and jobbers will get that much steel, but they are allowed that much. How much these consumers get will be dictated by the present high priority rating and the availability of supplies.

High Priority Ratings Permit Warehouses to Get More Steel

Washington

• • • **OPM officials** today stated that steel quotas to warehouses are unaffected by orders received that have priority ratings higher than the A-7 rating assigned warehouses under order A-83. Hence, the higher priority rating on orders for steel entitles warehouses to steel over and above that provided under the A-83 order, permitting them to obtain steel in addition to their A-7 allotments.

MACHINE TOOLS

. . . SALES, INQUIRIES AND MARKET NEWS

Russia to Get Machinery Ordered by Japan

New York

• • • **Machine tools ordered** by Japanese interests some time ago but never shipped because of the lack of export licenses are now being turned over to the Russians, it has been learned. At least one Japanese buying house in New York has agreed to the cancellation of orders on the books of representative builders with the understanding that these machines would be diverted to the Russians. Advance cash payments are being refunded, although under the current "freezing" order, this money cannot be taken out of the United States. Shipments of machine tools to Japan stopped at the docks were commandeered by the government some months ago under a law permitting this action when export certificates are withheld.

Every effort is now being made by our government to facilitate Russian purchases of machine tools, even though they do not yet come under the Lend-Lease Act. Credit is being extended against future deliveries of strategic raw materials like manganese, chrome and platinum. Sizable groups of machines included in recent pool orders placed by the Defense Plant Corp. are being released to the Russians. Priority ratings as high as A-1-a are also being granted for repair parts for machine tools bought by the U.S.S.R. prior to the war. Russian buying has been heavy in recent weeks.

Hint That Dealer Profits May Be Limited to 6%

Cleveland

• • • **It has been rumored** that Washington officials may attempt to limit profits of machine tool dealers to approximately 5 to 6 per cent, before taxes. If this develops, dealers probably will be hard hit in view of the fact that the average return on most transactions is now in the neighborhood of 10 per cent. With the normal corporate tax increased and excess profits taxes eating heavily into corporate income, it is likely that the actual profit that will be made in 1941 by most dealers, on the present basis will be close to 4 per cent, after all taxes.

One difficulty that will be faced by dealers and small manufacturers in the event of profit limitation will be the financing of purchases made through the Defense Plant Corp. Due to the fact that the heavy number of invoices handled by the DPC prevents speedy clearing, this important purchaser of machine tools has taken anywhere from 60 to 90 days to make payment. On the other hand, usual sales are 30 days net, so that some dealers are actually financing the spread between the dates of their payment to the machine tool producers and their subsequent reimbursement by DPC. If the interest on borrowed funds to cover such transactions is taken into consideration, the average return of most dealers would probably drop to the vicinity of 8 per cent, before taxes.

↓ ↓

Cleveland

• • • **The National Machine** Tool Builders Association estimated that 200,000 machine tools will be built in 1941 at a price of $750,000,000. Normal production of machine tools runs about 25,000 per year. In 1940, about 100,000 machine tools were produced at a selling price of $450,000,000. The 300,000 machines produced in the two years since the President launched the defense program in his address to Congress on Jan. 3, 1940, is equal in number to almost one-third the number of machine tools in existence on that date.

Improvements made in the machines themselves, in automatic operation and in the application of new cutting materials have made these 300,000 machines three times as productive as the average of the 930,000 machines in use in January, 1940, it is believed. To that extent, the productive capacity of 1940-41 machines will practically equal that of all the tools in the country's plants 20 months ago. This is a dramatic illustration of how well the machine tool industry has been filling its assignment of building a gigantic defense industry overnight.

Defense Projects Add To Orders

Chicago

• • • **Flow of orders and inquiries** on new machine tool orders continues at high levels here. This district is seeing an increase in number of outright government subsidized plants, all of which are seeking new equipment. Allis-Chalmers Mfg. Co., Milwaukee, W. F. & John Barnes Co., Rockford, and American Steel Foundries are among the leading ones which have been dropped on this district. The last named will operate a new $9,000,000 tank equipment plant, and will spend over $5,000,000 for new equipment.

Used machinery dealers still contend that they have ample stocks of usable equipment which could be turned to defense production but is not selling because buyers hold on to their craze for new equipment. Of course, there are few choice used machines available, but a lot of worthy equipment can be had. Dealers' also avow that their purchases of machines are hurt because of lofty prices owners are asking.

Shipments Being Held Up

Cincinnati

• • • **Delay in receiving shipping** orders for the defense set-up, is causing some consternation among district machine tool builders. In some plants, assembly and shipping room floors are being cluttered up with a substantial number of machines awaiting shipping instructions. During the past week, one manufacturer indicated the presence of several dozen tools all in readiness for immediate shipment, but which are being held pending the proper papers. Meanwhile, the local priorities office is working hard to ease the difficult situation but, of course, this is only within the limited sphere of a branch office. Despite increased production, new business continues to flow in and local manufacturers feel that the peak has not yet been passed. Potential business, both under the defense and the lend-lease set-up, is reported large.

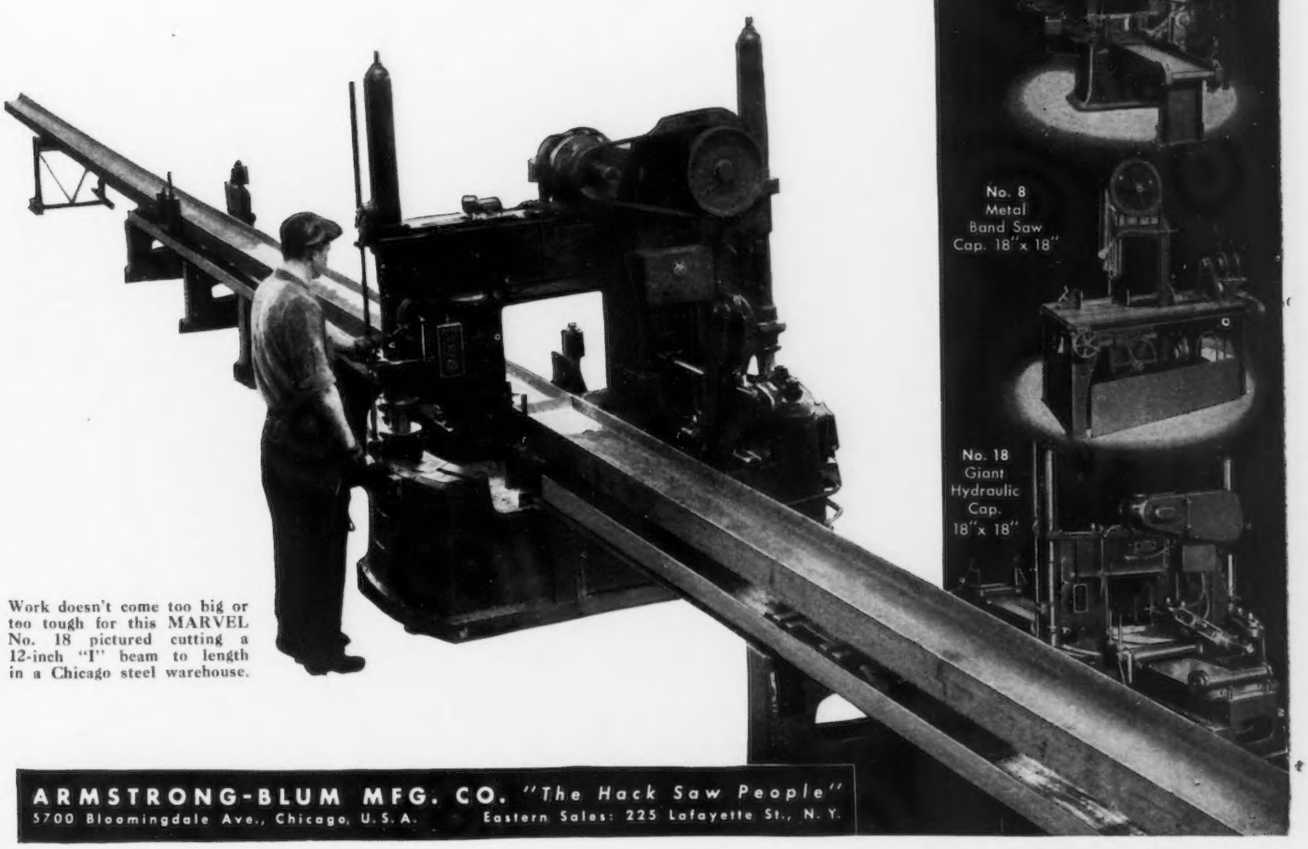
MARVEL SAWS

Built for tough jobs . . . . . cuts-off the largest sizes and toughest steels

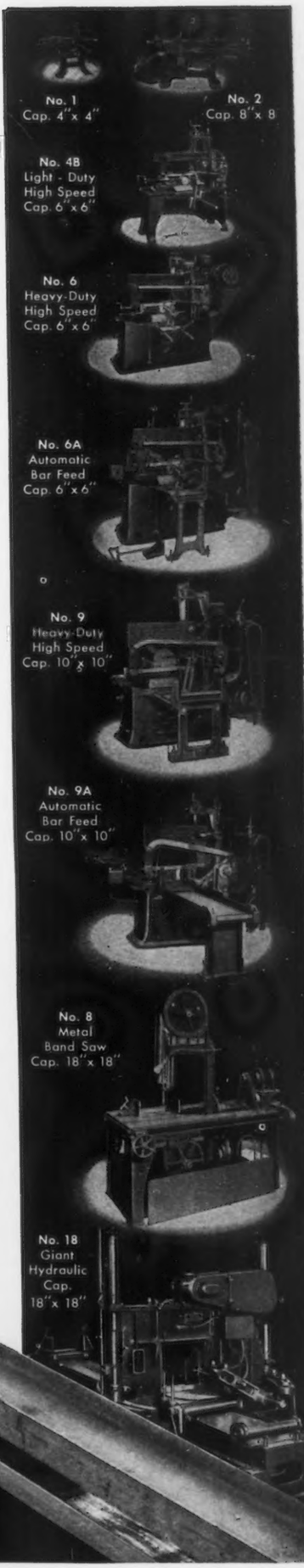
The new MARVEL No. 18 Giant Hydraulic Hack Saw is not stopped by the size or toughness of steel bars, billets or pieces. It will cut-off anything up to 18″ x 18″ square — and will cut-off rapidly and accurately.

Revolutionary in cutting principle and design, this "Saw of Tomorrow" introduces: (1st) Simplified, trouble-free *low pressure* hydraulic control, and (2nd) a unique chip-freeing "roll stroke" cutting action.

Built to handle large and heavy work, it is armored to withstand the bumping and thumping around that is part of handling big work.



Work doesn't come too big or too tough for this MARVEL No. 18 pictured cutting a 12-inch "I" beam to length in a Chicago steel warehouse.



ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U. S. A. Eastern Sales: 225 Lafayette St., N. Y.

SALES POSSIBILITIES

... CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

• **Acme Electro Plating Co.,** 798 Atlantic Street, Stamford, Conn., has approved plans for one-story addition, 40 x 125 ft. Cost close to $45,000 with equipment. David Mansell, 24 Park Row, Stamford, is architect.

Wrentham Products Co., Wrentham, Mass., mechanical equipment, plans one-story plant for production of aircraft engine parts for government. Cost about $442,250, to be provided by Defense Plant Corp., Washington.

Stevens Arms Co., Chicopee, Mass., has let general contract to Ernest F. Carlson, Inc., 1694 Main Street, Springfield, Mass., for one-story addition. Cost about $50,000 with equipment.

Maxim Silencer Co., 85 Homestead Avenue, Hartford, Conn., fire arms equipment, has let general contract to Industrial Construction Co., 721 Main Street, for two additions, two stories, 35 x 100 ft., and one-story, 96 x 100 ft. Cost over $85,000 with equipment. Buck & Buck, 650 Main Street, are architects and engineers.

Bullard Co., Bridgeport, Conn., machine tools, will carry out further expansion for production for government, to cost about $1,900,000 for machinery and other equipment, in addition to amounts previously noted. Fund to be provided by Defense Plant Corp., Washington.

Nicholson File Co., Acorn Street, Providence, R. I., has let general contract to Rowley Construction Co., 260 Central Avenue, Pawtucket, R. I., for power house. Cost close to $65,000 with equipment. Jenks & Ballou, Industrial Trust Building, Providence, are architects and engineers.

Globe-Union, Inc., 19 Power House Street, South Boston, electric batteries and parts, roller skates, etc., has work under way on one-story branch plant, 100 x 180 ft., at Medford, Mass., for which J. J. Vaccaro, 44 Liberty Avenue, Somerville, Mass., is general contractor. Cost over $75,000 with equipment. William A. Dykeman, 46 Cornhill Street, Boston, is architect. Headquarters are at Milwaukee.

Linde Air Products Co., 30 East Forty-second Street, New York, has let general contract to James Stewart & Co., 230 Park Avenue, for branch plant on Armstrong County Fairgrounds, near Kittanning, Pa., comprising production buildings, power house, machine shop and other structures. Cost close to $3,000,000 with equipment.

Union Bag & Paper Corp., Woolworth Building, New York, plans several one and multi-story additions to kraft paper mill at Savannah, Ga., totaling over 250,000 sq. ft. of floor space, for expansion in sulphate pulp mill and paper-making division, to include new 234-in. paper machine and auxiliary equipment. Cost close to $4,600,000 with machinery.

Mathieson Alkali Works, Inc., 60 East Forty-second Street, New York, plans expansion at branch plant at Lake Charles, La., for production of magnesium for government; also will increase capacity of power plant. Cost about $16,000,000 for land, buildings and equipment. Fund in that amount will be provided by Defense Plant Corp., Washington.

American Brake Shoe & Foundry Co., 230 Park Avenue, New York, will take new bids on general contract for one-story addition to foundry division at branch plant, 2001 Laurens Street, Baltimore, for which bids on initial call recently were rejected. Cost over $175,000 with equipment. O. D. Conover, 1740 East Twelfth Street, Cleveland, is consulting engineer.

Bell Aircraft Corp., 2050 Elmwood Avenue, Buffalo, has let general contract to Austin Co., Cleveland, for additions to branch plant at Wheatfield, near Niagara Falls, N. Y., totaling about 550,000 sq. ft. of floor space, for production of airplanes for government, which will furnish fund of $8,456,175 for project, as previously announced; of this amount approximately $2,859,250 will be used for purchase of machinery and other equipment. New additions will convert Wheatfield plant from an assembling works to a fully self-contained production works, similar to Buffalo plant.

Rane Tool Co., Inc., Ross Street, Jamestown, N. Y., dies, jigs, tools, etc., has begun work on one-story addition, 55 x 85 ft., for which general contract recently was let to Warren Construction Co., 335 Steele Street. Cost close to $50,000 with equipment.

General Mills, Inc., Nichigan and Ganson Streets, Buffalo, cereals, plans installation of packaging, mechanical-handling and kindred equipment at local plant, recently rebuilt following fire loss. Mills will be developed to produce a complete line of cereal specialties, now manufactured at other company plants in different parts of country. Main offices are at Minneapolis, Minn.

Richards Chemical Works, Inc., 190 Warren Street, Jersey City, N. J., has let general contract to Hudson Concrete Construction Co., 454 Montgomery Street, for two-story addition, about 65 x 100 ft. Cost close to $50,000 with equipment.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until Oct. 13 for twist drills (Circulars 639 and 650), wrenches (Circular 652), cutters and saws (Circular 660), steel wire nails (Circular 655); until Oct. 14, machine bolts (Circular 654), welding electrodes (Circular 667).

C-O-Two Fire Equipment Co., 10 Empire Street, Newark, N. J., carbon dioxide fire extinguishers, parts, etc., has let general contract to Wigton-Abbott Corp., 1225 South Avenue, Plainfield, N. J., for new one-story plant, 220 x 440 ft., at Highway Route 25 and Haynes Avenue, Port Newark. Cost over $350,000 with equipment.

Air Associates, Inc., Bendix Airport, Bendix, N. J., aircraft equipment and accessories, is arranging stock issue to total about $1,300,000, part of proceeds to be used for expansion. Company has work under way on one-story addition, about 70,000 sq. ft. of floor space, for which general contract has been let to Brown & Matthews, Inc., 122 East Forty-second Street, New York. About $200,000 of new financing will be used for equipment.

Atlantic Refining Co., 260 South Broad Street, Philadelphia, oil products, has let general contract to Lauter Construction Co., Otis Building, for one-story addition to bulk storage building, 70 x 215 ft. Cost close to $50,000 with equipment.

Jacobs Aircraft Engine Co., Pottstown, Pa., has plans for new works for production for government, comprising main one-story unit and auxiliary buildings. Fund of $13,056,325 will be secured through Defense Plant Corp., Washington, for project.

Bureau of Yards and Docks, Navy Department, Washington, has let general contract to Turner Construction Co., 420 Lexington Avenue, New York, for multi-story storehouse at Philadelphia Navy Yard to cost $2,078,800 (Specification 10490). Mechanical-handling and other equipment will be installed.

American Locomotive Co., 30 Church Street, New York, plans one-story addition to branch plant at Latrobe, Pa., about 50 x 120 ft. Cost over $75,000 with equipment.

Hercules Powder Co., Delaware Trust Building, Wilmington, Del., plans addition to rosin plant at naval stores plant, Hattiesburg, Miss., to increase capacity about one-third. Cost over $100,000 with equipment.

Crown Cork & Seal Co., Eastern Avenue and Kresson Street, Baltimore, has let general contract to Cummins Construction Co., 863 Cathedral Street, for one-story buildings on O'Donnell Street, for storage and distribution. Cost close to $125,000 with equipment. Lucius R. White, Jr., 10 West Chase Street, is architect.

Public Works Officer, Naval Academy, Rifle Range, Annapolis, Md., asks bids until Oct. 15 for one-story storage and distributing building (Specification 10486).

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 14 for three motor-driven, ram-type, universal turret lathes for Boston Navy Yard; two similar lathes for Mare Island Navy Yard, Cal.; and 10 such lathes for Puget Sound Navy Yard, Wash. (Schedule 8790); 22 30-ton, and 160 10-ton tubing booms, and 22 30-ton and 160 10-ton boom steps for Brooklyn and Norfolk Navy Yards; eight 30-ton and 40 10-ton tubing booms, and eight 30-ton and 40 10-ton boom steps for Mare Island yard (Schedule 8859); motor-generator sets (Schedule 8862), portable motor-generator sets (Schedule 8845), motor-driven turret lathes (Schedule 8790) for Eastern and Western yards.

The South

• **Wright Automatic Packing Machinery Co.,** Durham, N. C., tobacco-packing and other special machinery and parts, plans new one-story plant at Holloway and Calvin Streets. Cost over $300,000 with equipment. Atwood & Weeks are architects; and Kelly, Siska & Hennessy, consulting engineers, both Durham.

Tampa Shipbuilding Co., Inc., Tampa, Fla., has arranged fund of about $495,000 for further expansion for construction of vessels for government. Company recently secured loan of $2,255,000 through RFC for new shipway, extensions in present shipways, shops and other structures. Work is under way.

Reynolds Metals Co., Federal Reserve Bank Building, Richmond, Va., plans expansion at aluminum plant at Listerhill on Tennessee River, about five miles from Sheffield, Ala., recently completed. New one and multi-story production units will be built, with storage and distributing buildings, machine shop and other structures. Cost about $8,000,000. Financing in that amount has been arranged through RFC.

Standard Oil Co. of Louisiana, Inc., Baton Rouge, La., has acquired about 75 acres approximately 10 miles from Chattanooga, Tenn., for new bulk gasoline storage and distribution terminal, to be served by pipe line of Plantation Pipe Line Co., an associated interest, now in course of construction. It will include large capacity steel tanks, pumping station and other facilities. Cost over $350,000 with equipment.

Sunray Oil Corp., Allen, Okla., plans expansion in oil refinery, including new catalytic polymerization unit for increased production of high-test gasoline for aircraft. Cost over $200,000 with equipment.

International Agricultural Corp., 61 Broadway, New York, affiliated with Union Potash & Chemical Co., same address, plans new magnesium plant in conjunction with a chloride production works near company properties at Carlsbad, N. M., output to be used by government. Each plant will comprise one and multi-story units, with auxiliary buildings for storage and distribution, power house and other structures. Entire project will cost approximately $12,317,000, fund to be secured through Defense Plant Corp., Washington, for land, buildings and machinery.

Alabama Electric Co-operative, Inc., Montgomery, Ala., plans new steam-electric generating station near city, for power supply for 10 cooperative electrical distribution organizations in Alabama and Florida; also

will build about 380 miles of transmission lines. Entire project will cost approximately $2,500,000. Financing in that amount has been arranged through Federal aid.

Platzer Shipbuilding & Dry Dock Co., 7925 Brays Street, Houston, Tex., plans expansion in shipyard, including two new shipways on Green's Bayou, near entrance to ship channel, with shops and auxiliary buildings. Cost over $500,000 with equipment.

Central States

• **Columbia Electric Mfg. Co.,** 4519 Hamilton Avenue, Cleveland, electro-plating generators and parts, motors, etc., plans one-story addition, about 50,000 sq. ft. of floor space. Contract has been let to Dean W. Rankin, 1836 Euclid Avenue, for modernization and improvements in an existing three-story building of about 25,000 sq. ft. of floor space. Entire project will cost over $150,000 with equipment. Christian, Schwarzenberg & Gaede Co., Union Building, is architect.

General Hard Chromium Plating Co., 13000 Athens Avenue, Cleveland, has let general contract to George A. Rutherford Co., 2725 Prospect Avenue, for one-story addition, 60 x 140 ft. Cost about $45,000 with equipment. Frank A. Katona, 11408 Continental Avenue, is engineer.

Parker Appliance Co., 17325 Euclid Avenue, Cleveland, tube couplings, fittings, etc., plans expansion for production of aircraft parts, including converting of plant for this purpose and installation of equipment. Cost about $432,200. Fund in that amount will be furnished by Defense Plant Corp., Washington.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Oct. 21 for container assemblies (Circular 676).

Owens-Illinois Glass Co., Ohio Building, Toledo, Ohio, has let general contract to Inge Construction Co., Inc., 2326 North Beckley Street, Dallas, Tex., for new plant near Waco, Tex., to include machine shop, power house and other structures. Cost over $500,000 with machinery.

National Bronze & Aluminum Foundry Co., East Eighty-eighth Street and Laisy Avenue, Cleveland, brass, bronze, aluminum and other metal castings, plans rebuilding plant, recently destroyed by fire. Loss close to $2,000,000 with equipment. Company was manufacturing aircraft castings, tank parts and other equipment for government.

Board of Education, Piqua, Ohio, plans one-story trade and vocational school. Cost about $100,000 with equipment. One-half of this amount will be arranged through Federal aid and remainder by bond issue. Walker, Norwick & Templin, American Building, Dayton, Ohio, are architects.

General Electric Co., Fort Wayne, Ind., has asked bids on general contract for extensions and improvements in factory buildings Nos. 16 and 17 at Fort Wayne works. Cost over $50,000 with equipment. Herbert B. Beidler, 952 North Michigan Avenue, Chicago, is architect.

Standard Oil Co. of Indiana, Inc., Whiting, Ind., plans rebuilding part of oil refining plant recently destroyed by fire. Loss about $100,000 with tanks and other equipment.

Missouri-Illinois Tractor & Equipment Co., St. Louis, tractors, parts, etc., recently organized, care of Hari Van Hoefen, 408 Pine Street, architects, has leased one-story building, 90 x 140 ft., to be erected at 712 Pennsylvania Avenue, by Murch-Jarvis Contracting Co., 111 North Fourth Street. Cost over $50,000 with equipment.

Sealright Co., Inc., Fairfax and Rickel Roads, Kansas City, Kan., bottle caps, closures, etc., has leased one-story building for expansion, to be erected on adjoining site by Kansas City Industrial Land Co. Cost over $50,000 with equipment.

E. H. Baare Mfg. Co., 1618-20 Tower Grove Avenue, St. Louis, wire guards for electric fans and kindred wire products, has leased neighboring property at 1610 Tower Grove Avenue, and will use for expansion.

Nash-Kelvinator Corp., 14250 Plymouth Avenue, Detroit, electric refrigerators, etc., has work under way on remodeling part of former works of Reo Motor Car Co., Lansing, Mich., for conversion for plant of about 450,000 sq. ft. of floor space for production of airplane propellers for government. General contract has been let to Christman Co., Lansing. Fund of about $8,500,000 has been secured through Defense Plant Corp., Washington, for project. Bowd & Munson, Lansing, are architects. Company also will use another part of former Reo works for manufacture of aircraft engine parts for government.

Yellow Truck & Coach Mfg. Co., Pontiac, Mich., has let general contract to Darin & Armstrong, Inc., 2041 Fenkel Street, Detroit, for one-story addition to No. 4 plant, for expansion in machine shop. Cost over $85,000 with equipment.

Aeroproducts Division, General Motors Corp., General Motors Building, Detroit, airplane equipment and parts, will carry out expansion in plants at Vandalia and Moraine City, Ohio, for production of aircraft propellers for government. Fund of about $11,453,100 has been secured through Defense Plant Corp., Washington.

Detroit Bevel Gear Co., 8130 Joseph Campau Avenue, Detroit, plans one-story addition and improvements in present plant. Cost over $45,000 with equipment. Shreve, Anderson & Walker, Marquette Building, are architects.

H. Kramer & Co., 1359 West Twenty-first Street, Chicago, metals, have asked bids on general contract for first unit of new smelting plant, one and one-half stories, about 70 x 130 ft. Bids will be asked soon for second unit on adjoining site, two stories, 120 x 145 ft. Entire project will cost close to $150,000 with equipment. Rissman & Hirsch-

feld, 65 East South Water Street, are architects.

Woodward Governor Co., Rockford, Ill., hydraulic turbine governors and kindred equipment, will carry out expansion for conversion of part of plant for production of aircraft parts for government. Cost about $152,650. Fund in that amount has been secured through Defense Plant Corp., Washington.

John Morrell & Co., Inc., Ottumwa, Iowa, meat packer, plans six-story addition for expansion in processing and canning divisions. Cost over $175,000 with equipment. Henschien, Everds & Crombie, Inc., 59 East Van Buren Street, Chicago, is architect and engineer.

Otter Tail Power Co., Fergus Falls, Minn., plans expansion in power plant near Canby, Minn., with installation of new 5000-kw. turbine-generator and auxiliary equipment. Cost about $200,000 with equipment. Financing is being arranged.

M. B. Austin Co., 108 South Desplaines Street, Chicago, electrical conduits and other electrical products, has let general contract to Power Construction Co., 212 South Marion Street, Oak Park, Ill., for new one and two-story plant in Northbrook section, 100 x 160 ft. Cost close to $80,000 with equipment. Morton L. Pereira & Associates, 100 West Monroe Street, are architects.

State Highway Commission, Ames, Iowa, has low bid from Emmert Construction Co., Grinnell, Iowa, for one-story and basement machine and repair shop, 148 x 152 ft. Cost close to $90,000 with equipment.

Western States

• **Rohm & Haas, Inc.**, 8990 Atlantic Avenue, South Gate, Los Angeles, industrial chemicals, has let general contract to Austin Co., 777 East Washington Boulevard, for one-story addition, 100 x 100 ft. Cost close to $75,000 with equipment.

Regal Amber Brewing Co., 675 Treat Avenue, San Francisco, has let general contract to H. E. Rahlmann, 251 Kearny Street, for one-story addition for storage and distribution. Cost close to $65,000 with equipment. H. C. Baumann, last noted address, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 14 for one motor-driven bore and face hydraulic grinding machine for Keyport, Wash., yard (Schedule 8357); until Oct. 16 for 39,700 lb. admiralty metal condenser tubing, and 36,400 lb. copper-nickel alloy condenser tubing for Mare Island Navy Yard, Cal. (Schedule 8821).

Western Steel Casting Co., 145 Horton Street, Seattle, has let general contract to H. D. Stewart, 2045 East Newton Street, for one-story foundry addition, about 70 x 75 ft. Cost close to $45,000 with equipment. Howard H. Riley, Joseph Vance Building, is architect.

North American Aviation, Inc., Inglewood, Cal., plans three additions, totaling about 180,000 sq. ft. of floor space, comprising one-story production unit for parts and assembling service, one-story addition to engineering building, and wind tunnel, 75 x 171 ft., and 30 ft. high. This is main part of expansion for production for government, for which fund of $795,300 has been secured from Defense Plant Corp., Washington.

Construction Quartermaster, Fort Mason, Cal., has low bid from Meyer Construction Co., 735 Portola Drive, San Francisco, for one-story motor repair shop at Fourth Echelon Base, Stockton, Cal., at $333,663, exclusive of equipment.

Associated Shipbuilders, Inc., 2751 Sixteenth Avenue, S. W., Harbor Island, Seattle, plans one-story machine and pipe shop, 80 x 120 ft., and one-story storage and distributing building, about 100 x 175 ft. Cost over $85,000 with equipment. William R. Baueris is company engineer.

Canada

• **Small Arms, Ltd.**, Lake Shore Road, Long Branch, Ont., is erecting one-story addition, for which general contract has been let to Ramsay Contracting Co., Ltd., 39 Indian Road Crescent, Toronto. Cost about $85,000 with equipment. Allward & Gouinlock, 57 West Bloor Street, Toronto, are architects.

Electric Steel, Ltd., St. Laurent Street, Cap de la Madeleine, Que., has let general contract to Anglin-Norcross, Quebec, Ltd., 892 Sherbrooke Street West, Montreal, for one-story addition. Cost over $400,000 with equipment.

Canadian National Railways, Ltd., Winnipeg, Man., has let general contract to Pearson Brothers, Ltd., McIntyre Building, for new mechanical-coaling dock and coal pocket at Wainwright, Alta. Cost about $175,000.

Gaspesia Sulphite Co., Ltd., Chandler, Que., has approved plans for expansion in sulphite pulp mill, comprising several one and multi-story units. Cost close to $500,000 with machinery.

Aluminum Co. of Canada, Ltd., 1700 Sun Life Building, Montreal, will start preliminary work at once on power development project on Peribonca River, Quebec, with total expenditure of about $35,000,000. Contract for construction of dam has been awarded to Foundation Co. of Canada, Ltd., 1538 Sherbrooke Street, Montreal, to cost $3,000,000.

Defense Keynotes Metal Congress

WITH the eyes of the entire world focused upon the American metal industry, a heavy responsibility hangs over the 23rd National Metal Congress and Exposition to be held in Philadelphia from Oct. 20 to 24 inclusive.

Keenly conscious of this responsibility, the sponsor of the Congress, the American Society for Metals, and the other cooperating societies—the Iron and Steel division and the Institute of Metals division of the American Institute of Mining and Metallurgical Engineers, the American Welding Society and the Wire Association—have developed a program designed to contribute substantially to efforts to speed America's armament production.

At the Congress will gather the very backbone of the defense effort, the metallurgists, plant operators and other executives of the metal working industry, come to pool their common knowledge on a scale unprecedented in America's industrial history. Plans announced for the technical sessions and the equipment exposition truly support the theme of the gathering—"New Aids to National Defense Production." Every item and method to be seen will have direct relation to the national preparedness program.

Roughly, the technical sessions will be divided into two phases. One will be that of discussing ways and means of increasing output and improving quality through manufacturing processes. The other phases will be that of studying and discussing, with qualified civilian and military authorities, the new problems of materials, such as substitution and conservation, arising from the defense program.

Supplementing the technical program will be one of the largest displays of new and improved metal working equipment in the history of the metal show. The equipment exhibit, with its usual large share of working displays, will occupy 105,000 sq. ft. in the Philadelphia Convention Hall and Commercial Museum. A preview of equipment on display at the Convention Hall is published in this issue.

One of the highlights of the Congress will be the National Defense Forums to be held at 2:30 and 8 p. m. each day. These meetings, 13 in all, will bring together civilian and military experts to discuss such problems as substitution and conservation, as involved in aluminum, tool steels, magnesium, copper, etc. They will also permit round table discussion of such questions as shell manufacture, case hardening, stainless and heat resisting steels, etc. After each meeting there will be a question and answer period designed to give everyone a chance to find the answer to his specific problem.

In addition to the technical forums, a number of non-technical talks are scheduled by military and OPM officials to describe in detail various phases of the armament program. These non-technical talks will be given each morning at 11:30 a. m.

The technical sessions will be held largely at the leading downtown hotels, although some meetings, including the national defense forums, will be held at the Convention Hall.

Another Congress feature of long standing, the ASM Campbell Memorial Lecture, will be given this year by R. F. Mehl, of the Carnegie Institute of Technology. The ASM is also sponsoring two series of educational lectures. One will be "Heat Flow in Metals," by J. B. Austin, United States Steel Corp., to be given daily at 5 p. m.; the other will be "Hardness and Hardness Measurement," by S. R. Williams, Amherst College, to be presented at 8 p. m. Monday, Tuesday and Wednesday.

One of the highlights of the AIME program will be the round table discussion of "Order-Disorder Phenomena" on Tuesday afternoon. This discussion will be led by Dr. W. B. Shockley of the Bell Telephone Laboratories. The AIME annual autumn dinner is set for Tuesday at 7:30 p. m.

The American Welding Society has scheduled some 64 papers in its general sessions and industrial and fundamental research meetings. In addition to various technical sessions, the welding society has set aside a meeting for consideration of the vital problem of training welders. The welding society's annual dinner is scheduled for Thursday at 7 p. m.

One of the highlights of the Wire Association's program is the Mordica Memorial Lecture, to be presented by K. B. Lewis on Tuesday morning. The association's annual meeting and presentation of medals is scheduled for Tuesday at 4 p. m., while its annual dinner and stag smoker will be held Wednesday at 7:30 p. m.

A correlated program of all meetings scheduled for the Congress is published in the following pages.

Among the exhibits at the Convention Hall, in addition to those shown in the article "Previews of the Metal Show," published in this issue, will be one by Revere Copper & Brass, Inc., showing defense products made of Revere products. This display will also illustrate how some of Revere's customers are turning from peace time to defense work. Specifically, there will be the case shown of a maker of lipstick cases and vanities going into production on shell primer bodies.

W. H. EISENMAN

Managing director of the National Metal Congress and Exposition

The Norton Co. exhibit will place emphasis on grinding education with the idea of helping industry train new workmen in grinding operations.

Looking forward to the time when cemented carbides will again be available commercially, Carboloy Co., Inc., is building its exhibit around future uses of carbides. Of special interest will be the display showing how cemented carbides can be used to virtually eliminate wear in critical machine parts. Charles Hardy, Inc., will display the latest advances in powder metallurgy.

Products which will aid in processing metals for defense uses will be featured by E. F. Houghton & Co. Prominent in this exhibit will be parts blackened with Houghto-Black, a low temperature salt for protecting and beautifying surfaces of low carbon steel.

Firth Sterling Steel Co. will show how its sintered carbide lathe tools and similar equipment are aiding in speeding output of gun barrels, artillery shells, etc.

A working exhibit showing how scale and dirt can be removed from 105 mm. shells with a shell blast cleaning cabinet will be shown at the Pangborn Corp. booth. In addition, the company will display units for small work and also a portable dust unit.

New round shank boring tools which have been added to the list of standard styles of Kennametal tools will be featured in the display of McKenna Metals Co. Typical work pieces machined with Kennametal in numerous plants will also be shown.

Substitutes for defense will be the theme of the Jessop Steel Co. display at the metal show. An agitator fabricated with Jessop "Silver-Ply" stainless clad steel will highlight the exhibit.

Amsco alloy heat resisting castings, particularly carburizing and heat treating containers, will be shown by the American Manganese Steel division of American Brake Shoe & Foundry Co. Slides at the booth of Babcock & Wilcox Co. will emphasize how highly mechanized and rigidly controlled is the making of modern refractories.

How accuracy of control for heat treating process can be obtained by proper use of scientifically precise instruments will be illustrated at the Leeds & Northrup Co. booth. Ajax-Northrup high frequency induction furnaces melting for steel alloys and centrifugal castings, as well as units for brazing, hardening and hot forming will be shown by the Ajax Electrothermic Corp.

Salvaging of broken and worn equipment by repair welding with copper and copper alloy rods will be illustrated by working exhibits at the booth of the American Brass Co. Both oxy-acetylene and electric arc welding technique will be covered.

A demonstration of the analysis of steel by the spectrographic method, a practical demonstration of a method of checking grades of steel by spark testing and a laboratory set-up showing fracture testing of heat treated bearing steels will be among the highlights of the Bethlehem Steel Co. exhibit.

Furnaces for bright annealing all forms of stainless steel and for heat treating armor plate, aluminum alloys, etc., will be exhibited by the Drever Co. A "magic selector" designed to help tool and die men select the proper steel for a specific use will be featured in the exhibit of the Carpenter Steel Co.

Abbreviations of names of the various cooperating societies used in the following program are as follows: American Society for Metals—ASM; American Institute of Mining and Metallurgical Engineers—AIME; American Welding Society—AWS; Wire Association.—WA.

METAL CONGRESS TECHNICAL PROGRAM

Monday, Oct. 20

9:00 A.M.

ASM, BALL ROOM, BENJAMIN FRANKLIN HOTEL.

The Nickel-Molybdenum System, by F. H. Ellinger, General Electric Co.

The Acicular Structure in Nickel-Molybdenum Cast Irons, by R. A. Flinn, American Brake Shoe & Foundry Co., Morris Cohen and John Chipman, Massachusetts Institute of Technology.

Elimination of Apparent Hot Brittleness of 0.50 Molybdenum Steel, by C. L. Clark, Timken Roller Bearing Co., and J. W. Freeman, University of Michigan.

Some Properties of Phosphorus-Titanium Steels, by G. F. Comstock, The Titanium Alloy Mfg. Co.

Wear Tests on Ferrous Alloys, by O. W. Ellis, Ontario Research Foundation.

ASM, WASHINGTON ROOM, BENJAMIN FRANKLIN HOTEL.

Effect of Microstructure Upon Work Hardening Characteristics of a 0.7¼% Carbon Strip Steel, by N. P. Goss and Wm. Brenner, Jr., Cold Metal Process Co.

Problems in the Drawability of Deep Drawing Sheets, by M. Asimow, Central Metal Products Co., and J. N. Crombie, Carnegie-Illinois Steel Corp.

A Study of Cutting Oils With and Without Added Sulphur, by O. W. Boston and J. C. Zimmer, University of Michigan.

Some Properties of Sintered and Hot Pressed Copper-Zinc Powder Compacts, by C. G. Goetzel, American Electro Metal Corp.

Homogenization of Copper-Nickel Powder Alloys, by F. N. Rhines and R. A. Colton, Carnegie Institute of Technology.

ASM, BETSY ROSS ROOM, BENJAMIN FRANKLIN HOTEL.

Magnetic Methods for Determining Carbon in Steel, by B. A. Rogers, Karl Wentzel and J. P. Riott, U. S. Bureau of Mines.

Application of Oscillograph to Determination of Cooling Rates of Quenched Steels, by C. R. Austin, R. M. Allen and W. G. Van Note, Pennsylvania State College.

Influence of Alloying Elements on the Critical Points of Steels as Measured by the Dilatometer, by R. N. Gillmor, General Electric Co.

X-Ray Study of the A_3 Point of Pure Iron Using the Geiger-Muller Counter, by A. P. Wangsgard, Pennsylvania State College.

Heat Etching as a General Method for Revealing the Austenite Grain Size of Steels, by O. O. Miller and M. J. Day, United States Steel Corp.

9:30 A.M.

Presentation of Medals and Prizes, AWS, Rose Garden, Bellevue-Stratford.

10:00 A.M.

AIME, PALM ROOM, RITZ-CARLTON.

Rates of High Temperature Oxidation of Dilute Copper Alloys, by F. N. Rhines, Carnegie Institute of Technology; W. A. Johnson, Westinghouse Research Laboratory, and W. A. Anderson, Carnegie Institute of Technology.

Effect of Columbium on Some Annealing Characteristics of Copper and 80-20 Cupronickel, by Alan U. Seybolt, Battelle Memorial Institute.

Recrystallization and Precipitation on Aging of Tin-Bismuth Alloys, by J. E. Burke, Norton Co., and C. W. Mason, Cornell University.

Ferromagnetic Nature of the Beta Phase in the Copper-Manganese-Tin System, by Louis A. Carapella, Naval Research Laboratory, and R. Nultgren, University of California.

10:15 A.M.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Specification of Weldability of Steels, by A. B. Kinzel, Union Carbide & Carbon Research Laboratories.

Weldability Tests of Nickel Steels, by C. E. Jackson and G. G. Luther, Naval Research Laboratory.

Weldability of Steels, by W. H. Bruckner, University of Illinois.

10:30 A.M.

AIME, FRENCH ROOM, RITZ-CARLTON.

Silicon-Oxygen Equilibria in Liquid Iron, by C. A. Zapffe and C. E. Sims, Battelle Memorial Institute.

Silicon Monoxide, by C. A. Zapffe and C. E. Sims, Battelle Memorial Institute.

11:30 A.M.

ASM National Defense Meeting, non-technical session, to be addressed by War Department representative.

12:15 P.M.

AIME, SUPPER ROOM, No. 1.

Committee on Physical Chemistry of Steel Making, luncheon meeting.

2:00 P.M.

AIME, BALL ROOM, RITZ-CARLTON.

Theory of Lattice Expansion Introduced by Cold Work, by C. Sener, State College of Washington.

Rapid Tension Tests Using the Two-Load Method, by A. V. de Forest, C. W. MacGregor and A. R. Anderson, Massachusetts Institute of Technology.

A New Method for Determination of Stress Distribution in Thin-Walled Tubing, by G. Sachs and G. Espey, Case School of Applied Science.

AWS, NON-FERROUS RESEARCH SESSION, ROSE GARDEN, BELLEVUE-STRATFORD.

Study of Effect of Core Wire Temper on the Quality of Welds in Monel, Nickel and Inconel, by F. G. Flocke and K. M. Spicer, International Nickel Co.

Flow of Metal in Brazing Aluminum, by M. A. Miller, Aluminum Research Laboratories.

Welding of Copper, by A. P. Young, Michigan College of Mining and Technology.

Spot Welding of Nickel, Monel and Inconel, by W. F. Hess and Albert Muller, Rensselaer Polytechnic Institute.

AWS, SHIPBUILDING SESSION, SOUTH GARDEN, BELLEVUE-STRATFORD.

Riveted vs. Welded Galvanized and

Corrosion Resisting Steel Smoke Pipes, by H. O. Klinke, U. S. Navy Yard.

Machine Flame Cutting in Ship Construction, by E. R. McClung and H. L. Wagener, New York Shipbuilding Corp.

Survey of Welding and Cutting in Ship Construction, by F. G. Outcalt and J. M. Keir, The Linde Air Products Co.

Welding Applications in Naval Machinery, by H. W. Hiemke and J. D. Bert, Navy Department, Bureau of Ships.

AWS, TRAINING SESSION, NORTH GARDEN, BELLEVUE-STRATFORD.

Training of Welding Operators, round-table discussion led by A. G. Bissell, Bureau of Ships, Navy Department.

AWS Minimum Requirements for the Training of Welding Operators, by A. B. Wrigley, Chairman of Committee.

Training Welders for National Defense, by James A. Waln, Defense Training Program, U. S. Office of Education.

Training of Oxy-Acetylene Welding and Cutting Operators, by D. E. Roberts, International Acetylene Association.

2:30 P.M.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL.

SUBJECT: LOW CARBON ALLOY STEELS.

Report from Conservation and Substitution Committee.

Commonly Used Alloy Steels That Are Scarce or Unobtainable, by W. Hildorf, Timken Steel & Tube Co.

Suggestions About Substitutes that Will Not Run Into Other Bottlenecks, by E. T. Barron, Carnegie-Illinois Steel Corp.

Discussion of Above Two Papers, by F. E. McCleary, Chrysler Corp.

Possibilities of Flame Hardening, by a speaker to be announced.

Changes in Mechanical Design of a Part to Permit Substitutes, by H. McQuaid, Republic Steel Corp.

Discussion and Question Period with above speakers acting as an information panel.

WA, HOTEL PHILADELPHIAN.

The Cable Industry in National Defense, by Kenneth Wyatt, Phelps Dodge Copper Products Corp.

Wings of the Army, sound motion picture supplied by Air Corps.

5:00 P.M.

Heat Flow in Metals, ASM educational lecture, by J. B. Austin, United States Steel Corp.

7:30 P.M.

Industrial Research Conference, AWS, G. F. Jenks, chairman.

8:00 P.M.

Hardness and Hardness Measurements, ASM educational lecture, by S. R. Williams, Amherst College.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL.

SUBJECT: ALUMINUM AND MAGNESIUM.

Aluminum Castings and Their Heat Treatment, by B. Clements, Wright Aeronautical Corp.

Aluminum Forgings and Their Heat Treatment, by L. W. Davis, Aluminum Co. of America.

Aluminum Structural Shapes and Sheet, and Their Heat Treatment, T. W. Bossert, Aluminum Co. of America.

Hotel Headquarters Of Technical Groups

Headquarters will be maintained by the various societies during the Metal Congress at the following hotels: American Society for Metals at the Benjamin Franklin Hotel; American Welding Society at the Bellevue-Stratford Hotel; American Institute of Mining and Metallurgical Engineers at the Ritz-Carlton Hotel, and the Wire Association at the Hotel Philadelphian.

Welding of Aluminum, G. O. Hoglund, Aluminum Co. of America.

Machining of Aluminum, W. A. Dean, Aluminum Co. of America.

Magnesium Castings, A. Winston, Dow Chemical Co.

Discussion and Question Period.

Summary, by H. Huester, Reynolds Metal Co.

ASM, NATIONAL DEFENSE MEETING, ROOM 300, CONVENTION HALL.

SUBJECT: MANUFACTURE OF SHELLS.

Shell Steel, Forged Shells, Heat Treatment and Sand Blasting, by speakers to be announced.

Machining of Shells, by B. C. Brosheer, American Machinist.

Cartridge Cases, by A. Morris, Bridgeport Brass Co.

Discussion and Question Period.

9:00 P.M.

Educational Conference, AWS, J. H. Zimmerman, presiding.

Tuesday, Oct. 21

9:00 A.M.

ASM, WASHINGTON ROOM, BENJAMIN FRANKLIN HOTEL.

Hardenability Testing of Low Carbon Steels, by R. C. Frerichs and E. S. Rowland, Timken Roller Bearing Co.

Hardenability of Shallow - Hardening Steels, by C. B. Post, O. V. Greene and W. H. Fenstermacher, Carpenter Steel Co.

Effect of Carbon Content and Cooling Rate on the Decomposition of Austenite During Continuous Cooling of Plain Carbon Steels, by R. F. Thomson and C. A. Siebert, University of Michigan.

Tensile Properties of Pearlite, Bainite and Spheroidite, by M. Gensamer, E. B. Pearsall, W. S. Pellini and J. R. Low, Jr., Carnegie Institute of Technology.

Effects of Initial Structure on Austenite Grain Formation and Coarsening, by M. Baeyertz, Carnegie-Illinois Steel Corp.

ASM, BALLROOM, BENJAMIN FRANKLIN HOTEL.

Urea Process for Nitriding Steels, by R. P. Dunn, Electro Manganese Corp., W. B. F. Mackay, Royal Canadian Air Force, and R. L. Dowdell, University of Minnesota.

The Kinetics of Graphitization in White Cast Iron, by H. A. Schwartz, National Malleable and Steel Castings Co.

Effects of Small Amounts of Alloying Elements on Graphitization of High Purity Hyper-Eutectoid Steels, by C. R. Austin, Pennsylvania State College, and B. S. Norris, United States Pipe & Foundry Co.

Effect of Cooling Temperature After Carburizing on Reheated and Single Quenched Steel, by O. W. McMullan, Youngstown Sheet & Tube Co.

Precipitation Reaction in Aged Cold-Rolled Brasses: Its Effects on Hardness, Conductivity, and Tensile Properties, by R. H. Harrington and T. C. Jester, General Electric Co.

ASM, BETSY ROSS ROOM, BENJAMIN FRANKLIN HOTEL.

Balancing the Composition of Cast 25 Per Cent Chromium, 12 Per Cent Nickel Type Alloys, by J. T. Gow and O. E. Harder, Battelle Memorial Institute.

Rate of Formation of Tin-Iron Alloy During Hot Dip Tinning As Measured By a Magnetic Method, by A. U. Seybolt, Battelle Memorial Institute.

Role of Nitrogen in 18-8 Stainless Steel, by H. H. Uhlig, General Electric Co.

Cyclic Temperature Acceleration of Strain in Heat Resisting Alloys, by G. R. Brophy and D. E. Furman, International Nickel Co.

Influence of Stress on the Corrosion Pitting of Steel in Distilled Water, by D. J. McAdam, Jr., and G. W. Geil, National Bureau of Standards.

9:30 A.M.

WA, HOTEL PHILADELPHIAN.

Mordica Memorial Lecture, by Kenneth B. Lewis, Consulting Engineer.

A Brief Discussion of the Manufacture of Steel For Arc Welding Electrodes, by C. W. Garrett, Jones & Laughlin Steel Corp.

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Magnetic Arc Blow, by C. H. Jennings and A. B. White, Westinghouse Electric & Mfg. Co.

Metal Transfer in the Metallic Arc, by L. J. Larson, Consulting Engineer.

Heat Flow in Arc Welding, by E. M. Mahla, M. C. Rowland, C. A. Shook and G. E. Doan, Lehigh University.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Welding As Applied to Locomotives, by James Partington, American Locomotive Co.

Design of the World's Largest Welded Flat Car, by H. M. Priest, United States Steel Corp.

Welding Locomotives, by A. J. Raymo, Baldwin Locomotive Co.

Pressure Butt Welding of Railroad Rails, by L. Adams, Oxweld Railroad Service Co.

10:00 A.M.

AIME, BALLROOM, RITZ-CARLTON HOTEL.

Effect of Cold Work and Annealing Upon Internal Friction of Alpha Brass, by C. Zener and H. Clarke, State College of Washington, and Stanley Smith, American Brass Co.

Strength Distribution in Sunk Brass Tubing, by G. Sachs, G. Espey and G. B. Kasik, Case School of Applied Science.

Residual Stress in Sunk Cartridge Brass Tubing, by G. Sachs and G. Espey, Case School of Applied Science.

Micrographic Observation of Slip Lines in Alpha Brass, by R. G. Treuting and R. M. Brick, Yale University.

AIME, FRENCH ROOM, RITZ-CARLTON.

Magnetic Determination of the A_3 Transformation Point in Iron, by B. A. Rogers and K. O. Stamm, U. S. Bureau of Mines.

Instability of Low-Expansion Iron-Nickel-Cobalt Alloys, by I. R. Kramer and F. M. Walters, Naval Research Laboratory.

Evaluation of Ductility of Steels for Welding, by A. B. Kinsel, Union Carbide & Carbon Co., Inc.

11:30 A.M.

ASM national defense session, non-technical session to be addressed by representative of U. S. Navy Bureau of Aeronautics.

12:15 P.M.

AIME Committee on Bessemer Steel, Luncheon Meeting, Supper Room No. 23, Ritz-Carlton Hotel.

1:00 P.M.

WA National Defense Luncheon, Hotel Philadelphian, address by Dr. Allan A. Stockdale, National Association of Manufacturers, and other speakers including officers of the Army and Navy.

2:00 P.M.

AWS, NORTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Weld Inspection by Means of Infra-Red Light, by Prof. W. T. Tiffin, University of Oklahoma.

Evaluating Welded Joints, by Prof. W. F. Hess, Rensselaer Polytechnic Institute.

Methods of Testing Spot Welds, by R. E. Bowman, War Department, Air Corps.

Thermal Gradients in Spot Welding Electrodes, by Dr. F. R. Hensel, E. I. Larsen and E. F. Holt, P. R. Mallory & Co.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Automotive Welding, by S. M. Spice, Buick Motor Division, V. Fegley, A-C Spark Plug Co., and L. M. Skidmore, G-M Institute of Technology.

Production and Quality Control in Aluminum Alloy Spot Welding, by P. H. Merriman, Glenn L. Martin Co.

Welding in the Aircraft Industry, by F. M. Smith, Stout Skycraft Co.

Condenser Discharge Welding of Aluminum Alloys, by J. W. Dawson, Raytheon Mfg. Co., and B. L. Wise, Federal Machine & Welder Co.

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Structural Welding, by V. R. P. Saxe, Consulting Engineer.

Design of a Welded Bridge, by G. T. Horton, Chicago Bridge & Iron Co.

Adapting Design and Construction Methods to Welding, L. Grover, Air Reduction Sales Co.

Cleveland Liquefied Gas Storage Tanks, J. O. Jackson, Pittsburgh-Des Moines Steel Co.

Bridge Welding, by T. H. Gardner, Florida East Coast Railway.

Order—Disorder Phenomena, by Dr. W. Shockley, Bell Telephone Laboratories, AIME, ballroom, Ritz-Carlton Hotel.

2:30 P.M.

ASM NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL

SUBJECT: HIGHER ALLOY STEELS.

Report From Conservation and Substitution Committee.

R. F. MEHL

ASM Campbell Memorial Lecturer

Outline of Function of Principal Alloys in Steel, by E. C. Bain, United States Steel Corp.

Commonly Used Alloy Steels That Are Scarce or Unobtainable, speaker to be announced.

Standardization of Steel Specifications, by C. L. Warwick, Division of Purchases, OPM.

Suggestions About Substitutes That Will Not Run Into Other Bottlenecks, by M. J. R. Morris, Republic Steel Corp.

Evaluating the Hardenability of Steel, by W. Jominy, Chrysler Corp.

Discussion of Previous Papers, by H. J. French, International Nickel Co.

Changes in Mechanical Design of a Part to Permit Substitution, by H. McQuaid, Republic Steel Corp.

Discussion and Question Period, with above speakers acting as members of the information panel.

4:00 P.M.

WA, Annual Meeting.

5:00 P.M.

Heat Flow in Metals, ASM educational lecture, by J. B. Austin, United States Steel Corp.

7:30 P.M.

AIME, Annual Autumn Dinner, ballroom, Ritz-Carlton.

Fundamental Research Conference, AWS, H. C. Boardman, presiding.

8:00 P.M.

Hardness and Hardness Measurements, ASM educational lecture, by S. R. Williams, Amherst College.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL.

SUBJECT: STAINLESS AND HEAT RESISTING STEELS.

Report from Conservation and Substitution Committee.

Problem of Conservation:

Substitutes for Decorative Uses, by C. E. Heussner, Chrysler Corp.

Use of Alloys of Lower Chromium and/or Nickel, by S. P. Watkins, Rustless Iron & Steel Corp.

Clad Materials, by Dr. S. L. Hoyt, Battelle Memorial Institute.

Conservation of and Substitution for Heat Resisting Alloys, by Dr. M. A. Hunter, Driver Harris Co.

Problem of Substitution:

Uses of Copper-Silicon and Other Copper Alloys, by J. Freeman, American Brass Co.

Lead, by R. L. Hallett, National Lead Co.

Silicon Irons, by D. E. Jack, Durion Co., Inc.

Calorized Irons, by B. J. Sayles, Calorizing Co.

Silicon Cementation, by H. K. Ihrig, Globe Steel Tubes Co.

Manganese, Copper, Aluminum, and Silicon as Substitutes for Chromium and Nickel in Quasi-Stainless Steels, by R. Franks, Union Carbide & Carbon Research Laboratories, Inc.

Silver and Platinum Lined Equipment, by F. E. Carter, Baker & Co.

Discussion and Question Period.

Summary, by R. J. McKay, International Nickel Co.

ASM, NATIONAL DEFENSE MEETING, ROOM 300, CONVENTION HALL.

SUBJECT: COPPER AND ITS ALLOYS.

Increasing Production by Elimination of Unnecessary Alloys, by D. K. Crampton, Chase Brass & Copper Co.

Standardization of Specifications, by C. L. Warwick, Division of Purchases, OPM.

Conservation of Copper by Use of Temporary Substitutes:

In Diversified Industry, by W. B. Price, Scovill Brass Co.

In Electrical Industry, by T. S. Fuller, General Electric Co.

In Communications Industry, by E. E. Schumacher, Bell Telephone Laboratory.

Use of Copper Alloys as Alternates for Scarce Metals, by J. R. Frenan, American Brass Co.

Copper and Its Alloys In Munitions Parts, by Lt. W. W. Culbertson, Frankford Arsenal.

Copper in Iron and Steel for Defense Work, by J. E. Jackson, Copper, Iron and Steel Development Association.

Discussion and Question Period, with above speakers acting as members of the information panel.

Wednesday, Oct. 22

9:30 A.M.

ASM, ANNUAL MEETING, BALLROOM, BENJAMIN FRANKLIN HOTEL.

***1941 Edward de Mille Campbell Memorial Lecture*, by R. F. Mehl, Carnegie Institute of Technology.**

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

***Tests of Miscellaneous Types of Welded Building Connections*, by Bruce Johnston and G. R. Deits, Lehigh University.**

***An Investigation of Welded Connections for Axially Loaded Angle Members*, by G. J. Gibson and B. T. Wake, American Bridge Co.**

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

***Welding in Aircraft Construction and Maintenance*, by A. K. Seemann, Linde Air Products Co.**

***Management Control of Design and Welding of Aircraft*, by J. P. Dods, Summerill Tubing Co.**

***Stored Energy Resistance Welding as Applied to Aircraft*, by L. P. Wood, Curtiss-Wright Corp.**

9:45 A.M.

WA, HOTEL PHILADELPHIAN.

Effects of Microstructure on the Galvanizing Characteristics of Steel, by Robert W. Sandelin, Atlantic Steel Co.

High Speed Rotary Knitting Machine for Covering Electrical Conductors, by S. E. Brillhart, Western Electric Co.

2:00 P.M.

AIME, FRENCH ROOM, RITZ-CARLTON HOTEL.

Relief of Residual Stress in Some Aluminum Alloys, by L. W. Kempf and K. R. Van Horn, Aluminum Co. of America.

Preferred Orientation in Rolled Magnesium and Magnesium Alloys, by P. W. Bakarian, Dow Chemical Co.

Corrosion Studies of Magnesium and Its Alloys, by J. D. Hanawalt, C. E. Nelson and J. A. Peloubet, Dow Chemical Co.

AIME, BALLROOM, RITZ-CARLTON HOTEL.

Mechanical Properties of Iron-Manganese Alloys, by F. M. Walters, Jr., I. R. Kramer and B. M. Loring, Naval Research Laboratories.

Influence of Chromium and Molybdenum on Structure, Hardness and Decarburization of 0.35 per cent C Steel, by R. F. Miller and R. F. Campbell, United States Steel Corp.

S-Curve of a Chromium-Nickel Steel, by B. M. Loring, Naval Research Laboratories.

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Structural and Metallurgical Properties of Condenser Discharge Spot Welds, by G. S. Mikhalapov and T. F. Falls, Taylor Winfield Corp.

Pulsation Welding of Heavy Structures, by O. C. Frederick and R. P. McCants, General Electric Co.

Electrical Characteristics of Resistance Welders and Proximity Effect of Magnetic Work Materials, by J. H. Cooper, Taylor Winfield Corp.

Power Control, by H. R. Crago, General Electric Co.

Forging Welding, by L. M. Benkert, Progressive Welder Co.

Spot Welding Control and Supervision, by J. R. Fetcher, E. G. Budd Mfg. Co.

AWS, NORTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Effect of Plate Temperature and Variable Wind Velocities on Properties of Carbon Steel Metal Arc Welds, by John L. Miller, Firestone Tire & Rubber Co., and E. L. Koehler, Illinois Institute of Technology.

Welding Aluminum-Containing Steels, by C. E. Sims and F. B. Dahle, Battelle Memorial Institute.

Notch Sensitivity of Welds Under Repeated Loading, by H. L. Daasch, University of Vermont.

Tee Bend Test as a Method of Determining Weldability of Steel, by G. A. Ellinger, Bureau of Standards, A. G. Bissell, Bureau of Ships, Navy Department, and M. L. Williams, Bureau of Standards.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Training Brazing Instructors for Defense, by L. Edelson, Handy & Harman.

Billet Cutting for Steel Forgings, by H. E. Rockefeller, Linde Air Products Co.

Machine Cutting in National Defense Work, by R. F. Helmkamp and A. H. Yoch, Air Reduction Sales Corp.

WA, HOTEL PHILADELPHIAN.

Stainless Wire for the Aircraft Industry, by J. K. Findley, Allegheny Ludlum Steel Corp.

Diamond Dies for High Speed Drawing of Copper Wire, by H. N. Padowicz, Western Electric Co.

Electrolytic Zinc Coated Wire, by L. H. Winkler, Bethlehem Steel Co.

2:30 P.M.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL

SUBJECT: HIGH STRENGTH, LOW ALLOY STEELS.

Report from Conservation and Substitution Committee.

Alloys Available to Give Strength Without Heat Treatment, by A. B. Kinzel, Union Carbide & Carbon Research Laboratories, Inc.

Limits of Alloying Before Weldability Is Impaired, by L. C. Bibber, Carnegie-Illinois Steel Corp.

Substitutes for Scarce Alloys, by B. D. Saklatwalla, Alloys Development Corp.

Substitutions in Various Industries:

Railroad Rolling Stock, by B. D. Saklatwalla, Alloys Development Corp.

Pressure Vessels, Piping and Bolting, by J. J. Kanter, Crane Co.

Large Forgings, by F. B. Foley, Midvale Co.

Ships' Hulls, by P. D. Field, Bethlehem Steel Co.

Bridges and Building Skeletons, by J. Jones, Bethlehem Steel Co.

Ultimate Conservation Due to Use of Less of Stronger Special Metal Rather Than More of Weaker Common Metal, by M. Scheil, A. O. Smith Corp.

Discussion and Question Period.

Summary, by J. C. Hodge, Wellman Engineering Co.

5:00 P.M.

Heat Flow in Metals, ASM educational lecture, by J. B. Austin, United States Steel Corp.

7:30 P.M.

WA Annual Dinner, Stag Smoker, Hotel Philadelphian.

8:00 P.M.

Hardness and Hardness Measurements, ASM educational lecture, by S. R. Williams, Amherst College.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL.

SUBJECT: INSPECTION OF METALS.

Principles of Inspection of Non-Ferrous Materials, by E. E. Thum, Metal Progress.

Principles of Aircraft Inspection, speaker to be announced.

Inspection of Aircraft Engine Materials, by E. S. Marks, Pratt & Whitney.

Army Ordnance Inspection, by Brig. Gen. R. H. Somers, U. S. Army Ordnance Dept.

Navy Ordnance Inspection, speaker to be announced.

Marine Construction Inspection, by Capt. R. T. Hanson, U. S. Navy.

Training of Inspectors, by Capt. K. J. Soderberg, Office of Chief of Ordnance, U. S. Army.

Discussion and Question Period.

Summary, by speaker from office of Chief of Ordnance.

Thursday, Oct. 23

9:30 A.M.

ASM, SYMPOSIUM ON CONTROLLED ATMOSPHERES, BALLROOM, BENJAMIN FRANKLIN HOTEL.

Fundamental Features of Controlled Atmospheres, Particularly for Heat Treatment of Steel, by H. W. Gillett and B. W. Gonser, Battelle Memorial Institute.

Chemical Equilibrium as a Guide in the Control of Furnace Atmospheres, by J. B. Austin and M. J. Day, United States Steel Corp.

Prevention of Oxidation Type of Reaction of Ferrous Metals, by A. G. Hotchkiss and H. M. Webber, General Electric Co.

Prevention of Oxidation Type of Reaction in the Heat Treatment of Copper and Its Alloys, by E. G. deCoriolis and William Lehrer, Surface Combustion Corp.

Heat Treatment of the Chromium-Carbon Stainless Steels, by W. E. Mahin and W. C. Troy, Westinghouse Electric & Mfg. Co.

ASM, BETSY ROSS ROOM, BENJAMIN FRANKLIN HOTEL.

Effect of Strain Rate Upon Tensile Impact Strength of Some Metals, by E. R. Parker and C. Ferguson, General Electric Co.

Effect of Grain Size and Heat Treatment Upon Impact Toughness at Low Temperatures of Medium Carbon Forging Steel, by S. J. Rosenberg and D. H. Gagon, National Bureau of Standards.

Low Temperature Impact Resistant Steel Castings, by N. A. Ziegler and H. W. Northrup Crane Co.

Dynamic Hardness Testing of Metals and Alloys at Elevated Temperatures, by Erich Fetz, C. O. Jelliff Mfg. Co.

ASM, WASHINGTON ROOM, BENJAMIN FRANKLIN HOTEL.

Microstructural Characteristics of High Purity Alloys of Iron and Carbon, by T. G. Digges, National Bureau of Standards.

Structure of Pearlite, by F. C. Hull Westinghouse Electric & Mfg. Co., and R. F. Mehl, Carnegie Institute of Technology.

Interlamellar Spacing of Pearlite, by G. E. Pellissier, International Nickel Co., M. F. Hawkes, Carnegie Institute of Technology, W. A. Johnson, Westinghouse Electric & Mfg. Co., and R. F. Mehl, Carnegie Institute of Technology.

Martensite Thermal Arrest in Iron-Carbon Alloys and Plain Carbon Steels, by A. B. Greninger, General Electric Co.

Study of Martensite Formation by a Photometric Method, by E. R. Saunders, Union Carbide & Carbon Corp., and J. F. Kahles, University of Cincinnati.

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Surface Polish and Contact Resistance, by W. B. Kouwenhoven and J. Tampico, Johns Hopkins University.

Structural Spot Welding Consistency Control Methods, by A. M. Unger, Pullman-Standard Car Mfg. Co.

Electrical Measurement of Electrode Pressure During Spot Welding, by W. F. Hess and L. D. Runkle, Rensselaer Polytechnic Institute.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Flame Hardening Internal and External Round Surfaces, by Stephen Smith, Air Reduction Sales Co.

Uses of Flame Hardening in Machine Tool Production, by A. L. Hartley, R. K. LeBlond Machine Tool Co.

Welding from a Foundryman's Viewpoint, by J. J. Curran and T. H. Booth, Walworth Co.

9:45 A.M.

WA, HOTEL PHILADELPHIAN.

Time, Temperature and Size in the Heating of Steel Wire, by R. R. Tatnall, Wickwire Spencer Steel Co.

Production of Commercial Bronze Screen Cloth Wire, by B. H. McGar, Chase Brass & Copper, Inc.

Steel for the Ages, sound motion picture, by Allegheny Ludlum Steel Corp.

11:30 A.M.

ASM non-technical defense session, to be addressed by representative of Navy Department.

2:30 P.M.

ASM, NATIONAL DEFENSE MEETINGS, BALLROOM, CONVENTION HALL.

SUBJECT: ALLOY CASTINGS, STEEL AND IRON.

Report from Conservation and Substitution Committee

Function of Nickel, Chromium and Vanadium That Are Scarce, by A. W. Demmler, Vanadium Corp. of America.

Function of Manganese That Is Probably Obtainable, by F. Grotts, Fort Pitt Steel Casting Co.

Function of Mo, Cu, Si, Ti, P That Are More Plentiful, by H. S. Austin, Buick Motor Car Division.

Utilization of Classified Scrap and Alloy Pig Iron, by V. Crosby, Climax Molybdenum Corp.

Ultimate Conservation Due to Over-All Economies of Stronger, More Machinable and More Durable Metal, by V. Crosby, Climax Molybdenum Corp.

Situation in Various Important Industries:

Automotive, speaker to be announced.
Railroad, by S. Z. Krumm, Buckeye Steel Castings Co.
Mining, speaker to be announced.
Power, by N. L. Mochel, Westinghouse Electric & Mfg. Co.
Chemical and Petroleum, by F. B. Foley, Midvale Co.
Machine Tools, by H. Ewig, Cincinnati Milling Machine Co.
Agricultural Machinery, by H. Bornstein, Deere & Co.

Question and Discussion Period.

2:30 P.M.

ASM, NATIONAL DEFENSE MEETING, ROOM 400, CONVENTION HALL.

SUBJECT: BEARING PROBLEMS—CONSERVATION AND SUBSTITUTION.

Replacing Tin-Base Babbitts by Lead-Base Babbitts, by C. E. Swartz, Cleveland Graphite Bronze Co.

Bronze Bushings, by E. R. Darby, Federal Mogul Corp.

Problems and Substitutes in Powder Metallurgy Bearings, by R. P. Koehring, Moraine Products Div., General Motors Corp.

Cadmium-Base Bearings, by C. F. Smart, Pontiac Motor Division.

Silver Bearings, by E. A. Ryder, Pratt & Whitney Aircraft Division.

Bearing Substitutes in the Automotive Industry, by A. F. Underwood, General Motors Corp.

Problems and Substitutes in Powder A. Zink, P. R. Mallory & Co.

Use of Iron-Copper Bearings, by A. J. Langhammer, Chrysler Corp.

Discussion and Question Period.

5:00 P.M.

Heat Flow in Metals, ASM educational lecture, by J. B. Austin, United States Steel Corp.

7:00 P.M.

ASM Annual Banquet, Benjamin Franklin Hotel.

AWS Annual Banquet, Bellevue-Stratford Hotel.

Friday, Oct. 24

9:30 A.M.

ASM, SYMPOSIUM ON CONTROLLED ATMOSPHERES, BALLROOM, BENJAMIN FRANKLIN HOTEL.

Atmospheric Control for the Prevention of Decarburization in Springs and Similar Products, by J. A. Comstock, Pratt & Whitney Aircraft Div.

Methods for Determining the Degree of Carburization or Decarburization and Evaluating Controlled Atmospheres, by N. K. Koebel, Lindberg Engineering Co.

Surface Effects Accompanying the Heating of Carbon Tool Steel in Oxidizing Atmospheres, by R. D. Stout and Toivo Aho, Lehigh University.

Discussion of Equipment, Instrumentation and Economy, by E. E. Slowter, Battelle Memorial Institute.

Atmospheric Control in the Heat Treatment of Aluminum Products, by P. T. Stroup, Aluminum Co. of America.

Atmospheric Control in the Heat Treatment of Magnesium Products, by C. E. Nelson, Dow Chemical Co.

ASM, WASHINGTON ROOM, BENJAMIN FRANKLIN HOTEL.

Electrical Resistance Method for the Determination of Isothermal Austenite Transformations, by F. B. Rote, International Nickel Co.; W. C. Truckenmiller, A-C Spark Plug Div., General Motors Corp., and W. P. Wood, University of Michigan.

The Tempering of High Carbon, High Vanadium High Speed Steels, by B. S. Lement and Morris Cohen, Massachusetts Institute of Technology.

Transformation of Retained Austenite in High Speed Steel at Sub-Atmospheric Temperatures, by M. P. Gordon and Morris Cohen, Massachusetts Institute of Technology.

Study of Dimensional and Other Changes in Various Die Steels Due to Heat Treatment, by G. M. Butler, Jr., Allegheny-Ludlum Steel Corp.

Hardening Characteristics of an Iron-Cobalt-Tungsten Alloy, by W. P. Sykes, General Electric Co.

ASM, BETSY ROSS ROOM, BENJAMIN FRANKLIN HOTEL.

Over-All Linear Expansion of Three Face-Centered Cubic Metals (Al, Cu, Pb) From —190° C. to Near Their Melting Points, by J. W. Richards, Mt. St. Mary's College.

Temperature and Manner of Growth of Shatter Cracks in Steel Rails, by H. B. Wishart and E. P. Epler, Carnegie-Illinois Steel Corp., and R. E. Cramer, University of Illinois.

Carbon-Oxygen Equilibrium in Liquid Iron, by Shadburn Marshall, Remington Arms Co., and John Chipman, Massachusetts Institute of Technology.

Solubility of Iron Oxide in Liquid Iron, by John Chipman, Massachusetts Institute of Technology, and K. L. Fetters, Carnegie Institute of Technology.

Rapid Temperature Measurements of Molten Iron and Steel with an Immersion Thermocouple, by Fulton Holtby, University of Minnesota.

AWS, SOUTH GARDEN, BELLEVUE-STRATFORD HOTEL.

Flame Preheating and Stress-Relieving Arc Welded High Pressure Pipe Lines, by P. T. Onderdonk and Werner Peterson, Consolidated Edison Co. of New York.

Welding Pressure Vessels, Tanks and Heat Exchangers, by H. B. Schlosser, Edge Moor Iron Works.

Radiographic Examination of Heavy Plate, by O. R. Carpenter, Babcock & Wilcox Co.

AWS, ROSE GARDEN, BELLEVUE-STRATFORD HOTEL.

Hardness Measurements on Rolling Steel That Contained Welds, by J. T. Phillips, Foster Wheeler Co.

The Shotweld Process of Welding Stainless Steel, by Joseph Winlock and J. J. MacKinney, E. G. Budd Mfg. Co.

11:30 A.M.

AWS, annual business meeting, Bellevue-Stratford Hotel.

ASM non-technical defense session, to be addressed by OPM representative.

2:30 P.M.

ASM, NATIONAL DEFENSE MEETING, BALLROOM, CONVENTION HALL.

SUBJECT: MOLYBDENUM HIGH SPEED STEELS AND TOOL STEELS.

Report on Alloying Elements.

OPM Committee's Report on the Heat Treatment of Molybdenum High Speed Steel:

Operation, by N. I. Stotz, Universal-Cyclops Steel Corp.
Furnaces and Controlled Atmospheres, by C. I. Hayes, C. I. Hayes, Inc.
Salt Baths, by A. F. Holden, A. F. Holden Co.

Tool Steels, by J. P. Gill, Vanadium Alloys Steel Co.

Discussion and Question Period.

PREVIEW OF THE METAL SHOW

In these pages are illustrated a sampling cross-section of some of the new equipment to be unveiled for the first time at the National Metal Show at Philadelphia, Oct. 20-24. Most of this apparatus is for heat treating, welding and metal cutting, particularly with carbides. A great deal more equipment of this nature that has been described throughout the past year in the pages of THE IRON AGE will also be on display. Practically all of the exhibits are intended to facilitate defense production.

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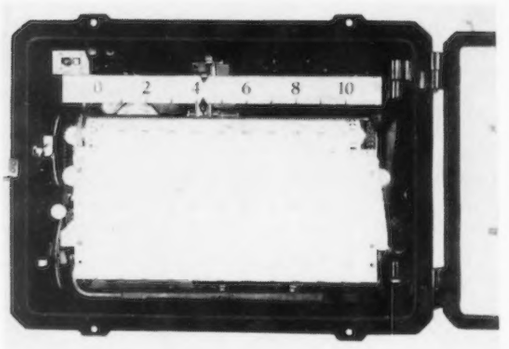
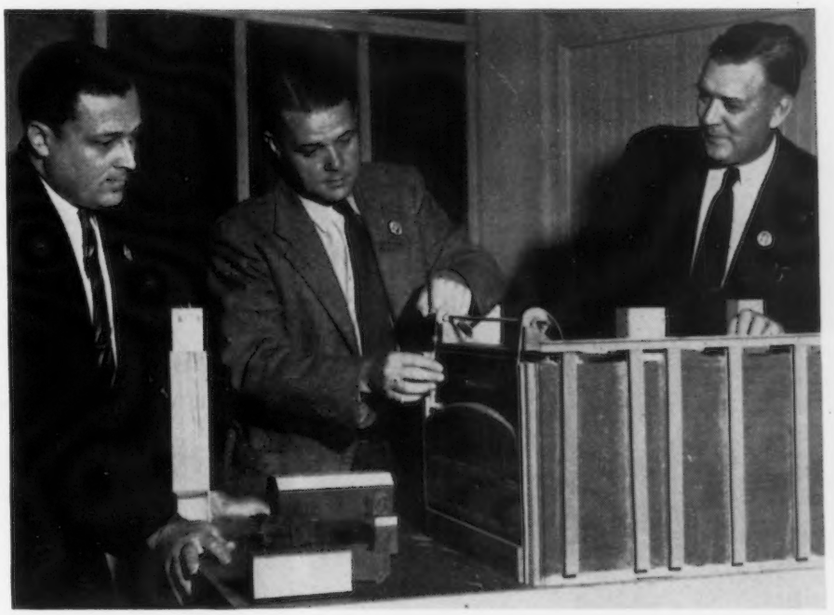


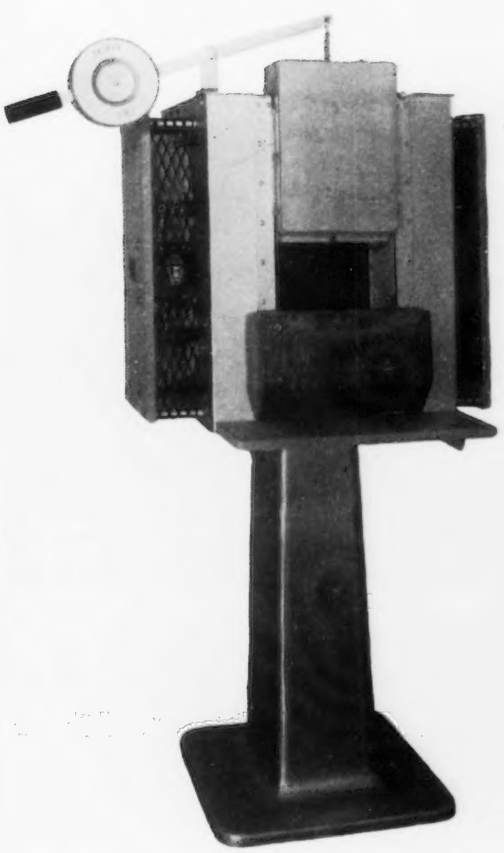
NEW TAG Celetray proportioning controller for throttling fuel heat now employs only a control instrument and a valve mechanism, eliminating the relay detector element formerly required. When starting up cold, as the temperature rises and enters the throttling zone, the valve will close a relay. This action prevents overshooting. The throttling zone can be readily adjusted within wide limits according to lag characteristics of the application and the maximum permissible sensitivity. Models without reset, with adjustment for manual reset (load error) or automatic reset are available. This new instrument can be seen at the booth of the C. J. Tagliabue Mfg. Co.

TYPICAL of the defense production uses to which the new two station 20-kw. Tocco Jr. electrical induction unit, just announced by Ohio Crankshaft Co., is the brazing of adapters on chemical shells, brazing collars and heads on burster tube assemblies, heating for forging of shells and heating for shaping airplane propeller hubs. The machine provides double the production capacity of the one station 20-kw. Junior introduced last spring, with no appreciable increase in power consumption. One operator handles both stations, preparing one fixture as the other is hardening. Electrical features and quenching system are similar to those found on other Tocco units.



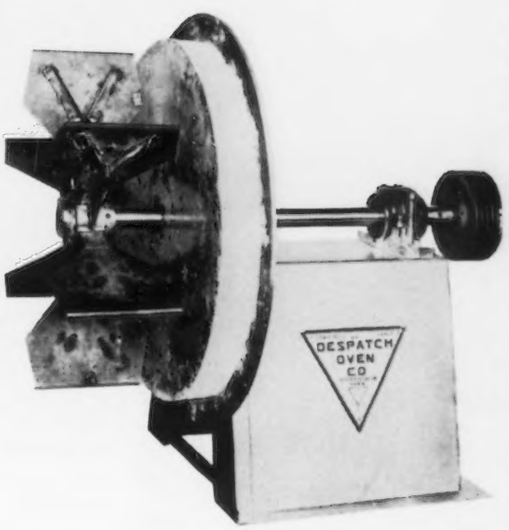
AT RIGHT

GENERAL Electric's display at Philadelphia will feature a model theater fashioned after a large electric furnace. Seating 50 people, the theater will be used for "House of Magic" presentations and a series of technical discussions. C. L. Ipsen (right), C. I. MacGuffie (left), managers of industrial heating and electric welding sales respectively, and R. B. Hanna are shown looking over a small model of the furnace theater.

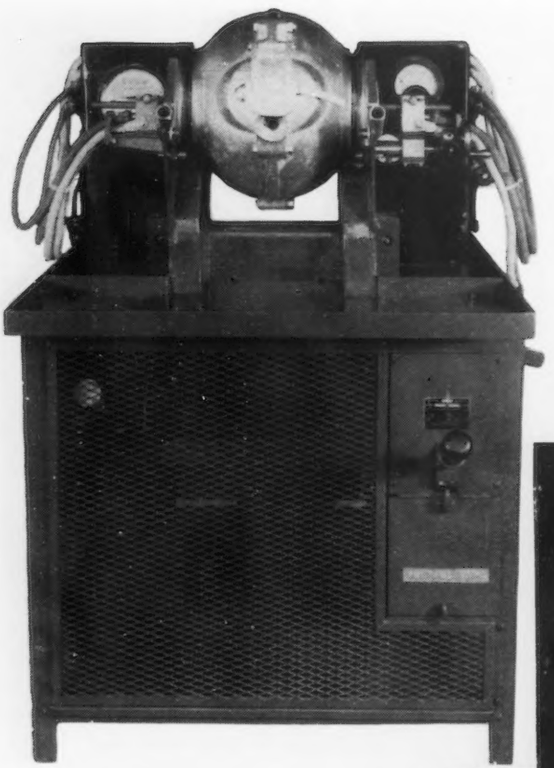


AT LEFT

A NEW and larger controlled atmosphere furnace for heat treating high speed steel is to be shown for the first time by the Sentry Co. The muffle is removable and has inside dimensions of 6 x 6 x 13 in., accommodating tools to a maximum of 4¾ x 4⅞ x 11 in. Known as size No. 4 model Y, this new furnace provides controlled atmosphere suitable for any type of high speed steel—molybdenum, cobalt or tungsten—through the use of the Sentry diamond block method. Maximum rating of the furnace is 22½ kw. and in normal operation the furnace will draw 5 to 15 kw. Heating time from cold to 2350 deg. F. is about 75 min. The pedestal type with loading shelf and wire mesh terminal guards is illustrated. A bench type is also made.

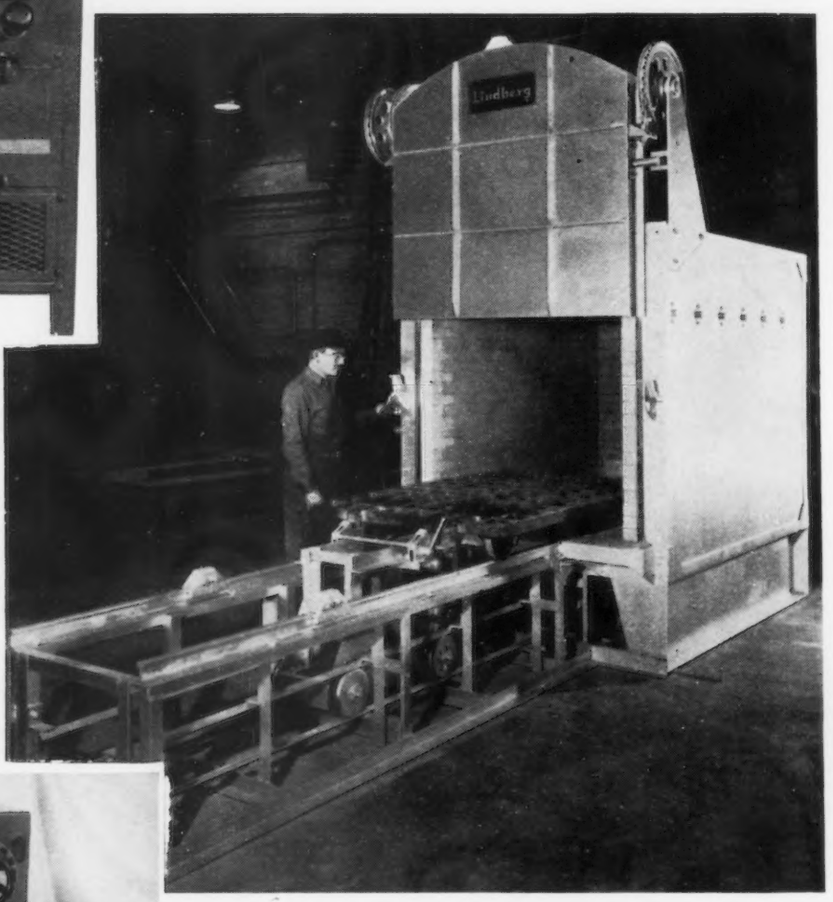


A LARGER and stronger heat resistant fan is being used to step up the heat distribution and air circulation of Despatch convection type furnaces. The result is extra assurance that the work chamber need not be subject to radiant heat and that uniformity under all conditions is maintained. Because of the high velocity of heated air created, there are 500 to 600 air changes in the work chamber every minute. A dismantled fan of this type of construction will be on display at the Despatch Oven Co. booth.



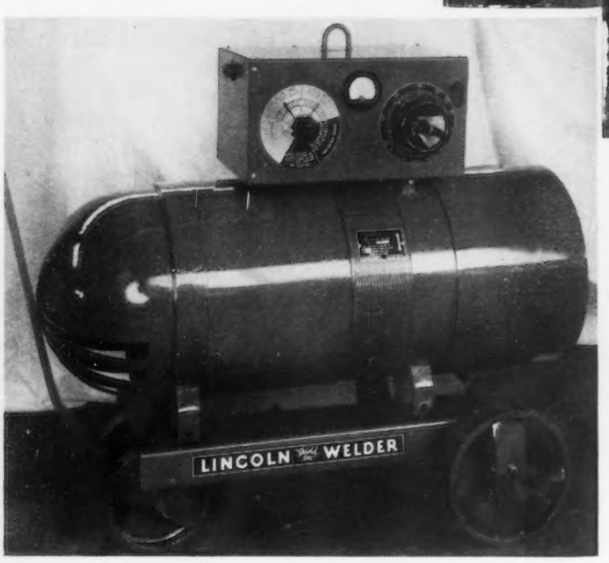
AT LEFT

A 10-LB. laboratory electric melting furnace is being exhibited for the first time by Kuhlman Electric Co., Detroit Electric Furnace Division. Transformer, control switch, etc., are mounted under the steel table on which the furnace is assembled and mounted for automatic rocking and direct pouring into molds. This small furnace is suitable for melting both ferrous and non-ferrous metals. A completely integrated unit, it requires 18 kva. of single phase 220 volt power supply.



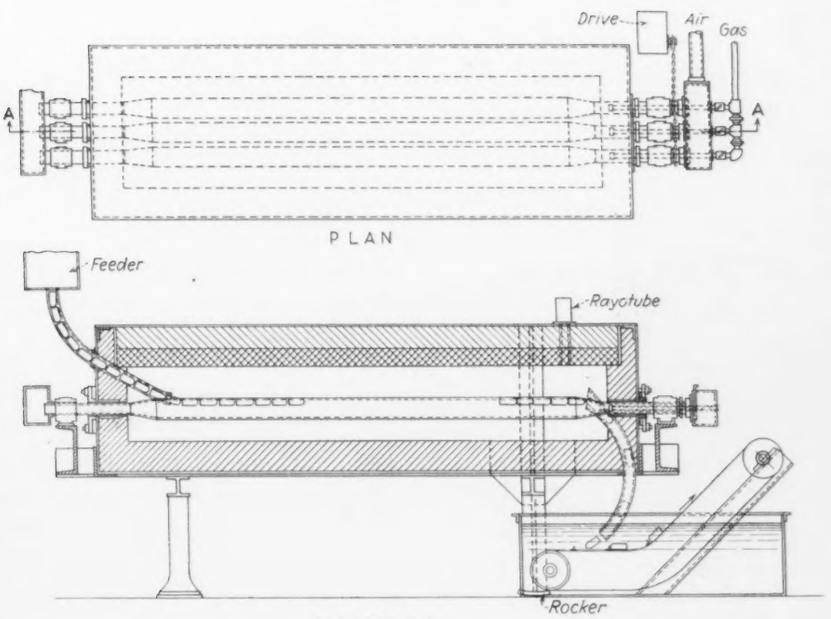
BELOW

AMONG the Lincoln Electric Co. exhibits will be this improved Shield-Arc SAE welder set, featuring a new control box of advanced design, also a shortened and widened base for greatly increased stability.

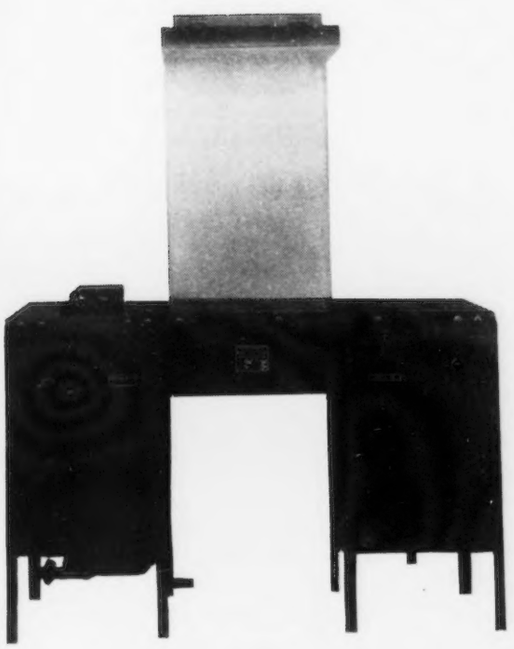


ABOVE

ALUMINUM casting quenching operations can be speeded up with this new Lindberg "Cyclone" electric furnace with roller grid. The loaded grid is quickly pulled out of the furnace by the lower carriage which is powered by an air cylinder and has an automatic engaging latch. When the grid is in the open, the work can be rapidly removed for quenching. The grid is then reloaded and automatically moved back into the work chamber, the carriage disengaged and moved back to allow the hand controlled air operated door to lower into place. Heating is by the Cyclone principle which employs a high velocity fan to force large volumes of air under pressure around the work, rapidly heating it to a uniform temperature.



A PRODUCTION model of a rolling tube furnace especially designed for the heat treatment of projectiles will be shown by Lee Wilson Sales Corp. The unusual feature of this equipment is that the heating elements and conveyor are one and the same, consisting of alloy heat resisting tubes running lengthwise of the furnace and rotated close together on a slight incline. Gas is fired into one end of the tubes. The material to be heated, such as a projectile, is delivered by magazine pusher feed or hand feed into the grooves between the heater-conveyor rolls and rotated quite rapidly as they slowly progress through the heating chamber, the rate of longitudinal travel depending upon the inclination of the conveyor.

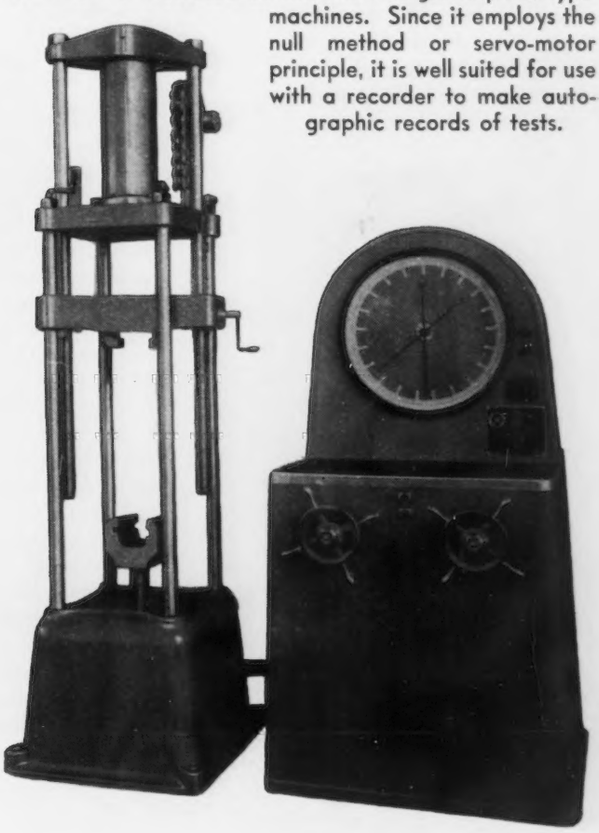


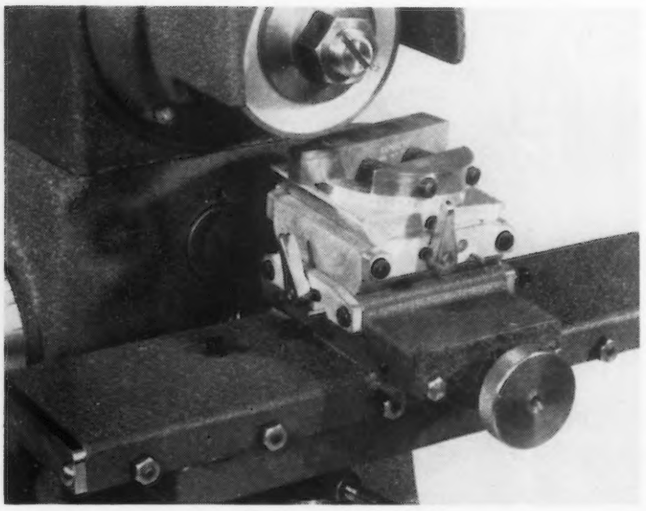
ABOVE

AN entirely new Magnaflux unit, known as model SCQ-SH-10, will be shown by the Magnaflux Corp. for the rapid inspection of small parts by the wet continuous method using longitudinal magnetization. A feature of this unit and also of a modified model AN unit to be exhibited is the use of dry plate rectifiers. This source of d.c. eliminates the necessity of servicing and replacing storage batteries and enables the operator to obtain high current output throughout the day without fear of dropping below the necessary current values.

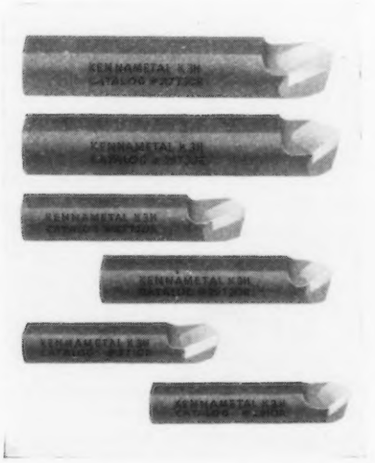
BELOW

A BALDWIN-TATE-EMERY physical testing machine, model 60-35 of 60,000 lb. capacity, to be shown by Baldwin-Southwark, is built for rapid routine testing of metals. A machine of similar design but of smaller capacity is also announced for testing plastics. The machines employ the lapped ram principle for load application. The operating ram is at the top and the straining yoke is carried in this ram on a ball-ended strut. The load indicating unit is similar to that used on the firm's larger capsule type machines. Since it employs the null method or servo-motor principle, it is well suited for use with a recorder to make autographic records of tests.

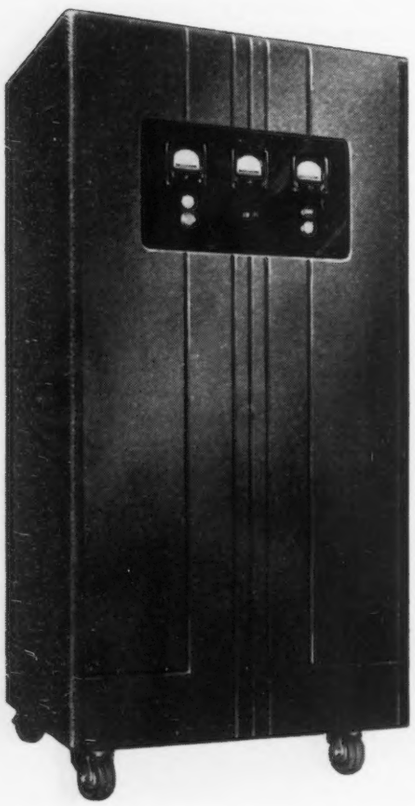




THREE separate planes of adjustment are featured in the tool vise of the chip breaker grinder for carbide tools, to be exhibited by Hammond Machinery Builders, Inc. Each plane adjusts by means of accurately scaled readings. The vise consists of two steel blocks rounded on the bottom, cradled into each other at right angles and "frozen" together after adjustment by cam locks operating in machined segments located on the ends of each block. The vise jaws are carried in a flat circular piece mounted on top of these blocks that swivels 90 deg. from center of any of the four sides of the block below. The vise is mounted onto the reciprocating table below and cross-feeds by means of a calibrated handwheel. Grooving is accomplished by longitudinal movement of the table by means of a lever after the table has been elevated by handwheel.



McKENNA Metals Co. will show a new series of standard Kennametal boring tools with round shanks, to be shown as styles 27-R and 29-R. Like other Kennametal tools, these boring tools have a 20 deg. back rake to compensate for the negative effect of the tool being held at one-half the height of the shank above center. Style 27-R tool is for use in 30 deg. boring bars; style 29-R, in 45 deg. boring bars. Either tool style may be tipped with Kennametal grades KM or K3H.

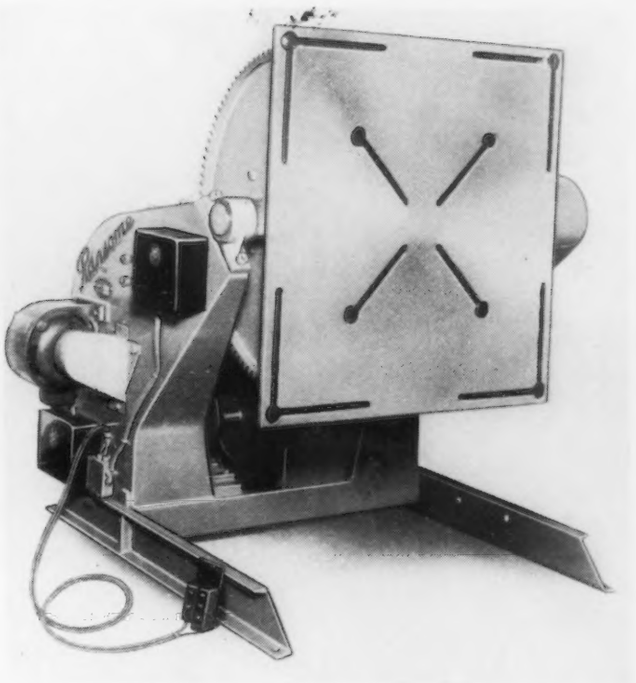


AT LEFT

SOMETHING entirely new in induction heating apparatus to be seen at the Metal Exposition will be this 10-kw. vertical model Thermonic generator, being displayed by the Induction Heating Corp. The three principal features are the use of a power vacuum tube as the high frequency converting element, power condenser which is self-healing in the event of short circuit, and automatic tuning. The later system employs coils rotated in relation to one another as in radio tuning. Only one variable control is required for manual operation, and a second control insures maximum operating efficiency over a wide range of applications. Frequencies as high as 500,000 cycles are transmitted through the work coil which is made of one or more turns of copper tubing. Either ferrous or non-ferrous metals may be heated for surface hardening, brazing, melting, annealing, forging or heat treating.

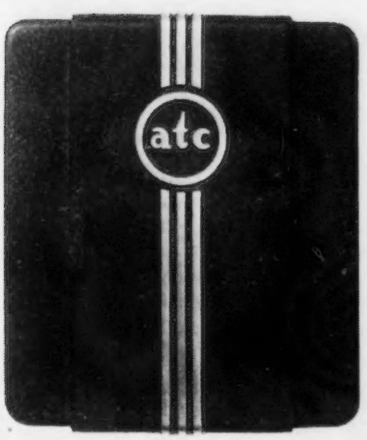
BELOW

NEWLY designed Mallory offset electrode holder fabricated entirely from wrought copper base alloys of high strength. This spot welding tip holder incorporates a patented tip knockout device making it possible easily and quickly to replace worn points. The tip seat is replaceable so that when the tapered seat for the electrode becomes worn, it can be replaced without obtaining an entirely new holder. This holder can be seen at the P. R. Mallory & Co. exhibit.



AT RIGHT

AN improved heavy-duty 3000-lb. capacity welding positioner will be shown by the industrial division of Ransome Concrete Machinery Co. The newly designed positioner has a 40-in. square machined steel table top provided with four radial and four longitudinal T-slots, making for easy set-ups. A 3000-lb. load may be carried with a center of gravity 12 in. above table and 12 in. eccentric from center of table. A motor tilts the table from horizontal to 45 deg. beyond vertical. Table is power rotated also. Construction is welded steel.

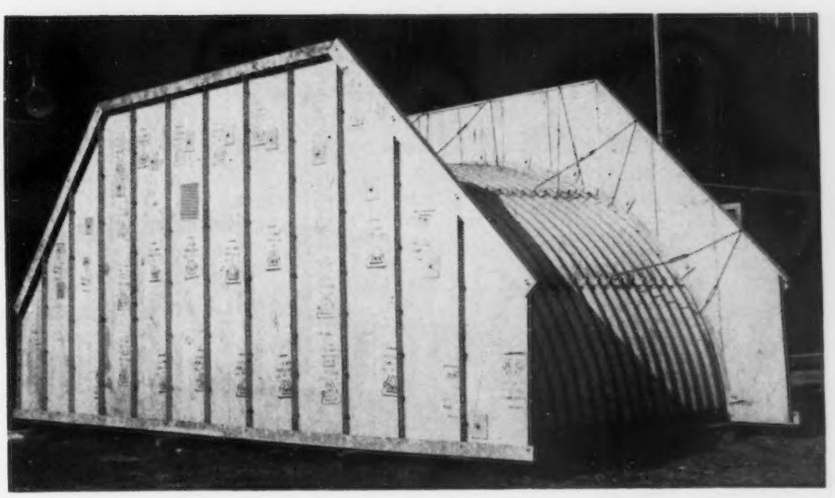


AT LEFT

A NEW time-temperature control system to be shown by Automatic Temperature Control Co., Inc., for the first time includes two adjustments, namely, rate of temperature increase or decrease in degrees per hour, and the number of hours during which this rate is to be maintained. When used in conjunction with any standard type of pyrometer and fuel regulator, control is completely automatic and at the end of the preset time, the temperature will be at the desired point. This controller, shown in a semi-dust-tight case, may be superimposed upon any type of control system, two-position, three-position or proportioning.

AT RIGHT

A COMPLETE air-raid and munitions shelter will be the focal point of the display of the American Rolling Mill Co. The main section of the shelter is formed from 7-gage Armco multi-plate corrugated sheets. End walls of the 14-ft. span are out-flanged channel sections fabricated from 11-gage galvanized sheets. The shelter has an 8 ft. rise. Visitors will see the shelter partly buried in a hillside and protected with sandbags. Inside will be bunks and ammunition.



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THE METAL INDUSTRY'S

BIGGEST DEFENSE MANEUVERS!

PHILADELPHIA, OCTOBER 20-24

The entire metal industry is pooling its knowledge of defense production and conservation at the 1941 Metal Congress & Exposition in Philadelphia, October 20-24.

Under direct request of many manufacturers a comprehensive program of group meetings on Defense Problems, Conservation and Substitution has been prepared. These group meetings are not to be of the ordinary round-table type where everything is left to chance but are to be well-planned presentations.

A representative will present at each meeting the latest information on the scarce materials involved in the clinic and the status of substitute materials, also indicating how industry can assist in and adjust itself to the present shortages. Since meetings will be "off-the-record" men of industry will be free to discuss actual production problems and quote examples.

Subjects to be discussed include alloy steels, stainless, molybdenum, tool steels . . . alloy castings . . . bearing metals . . . shells . . . aluminum . . . magnesium . . . copper . . . inspection of metals . . . priorities, etc.

In addition to these afternoon and evening clinic meetings, more than 80 technical papers will be presented at regular annual meetings of the four technical societies who cooperate in the Metal Congress.

And—at the Metal Exposition—the exhibits of 300 leading manufacturers in the metal industry (largest show ever held) will feature the latest, most modern materials, equipment, and processes for speeding production.

Don't miss the opportunity of hearing the nation's leading defense experts in Philadelphia—your defense job demands representation at the Metal Congress & Exposition!

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OCT. 20-24

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